THE JOURNAL OF GAS LIGHTING
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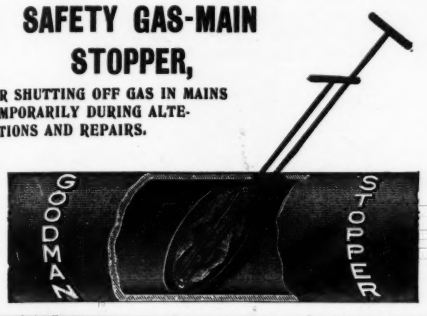

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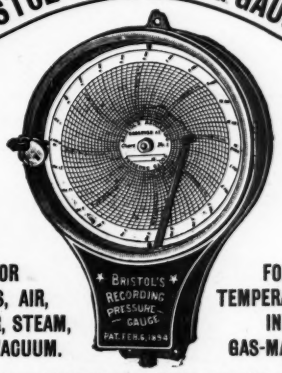

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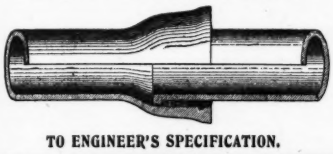

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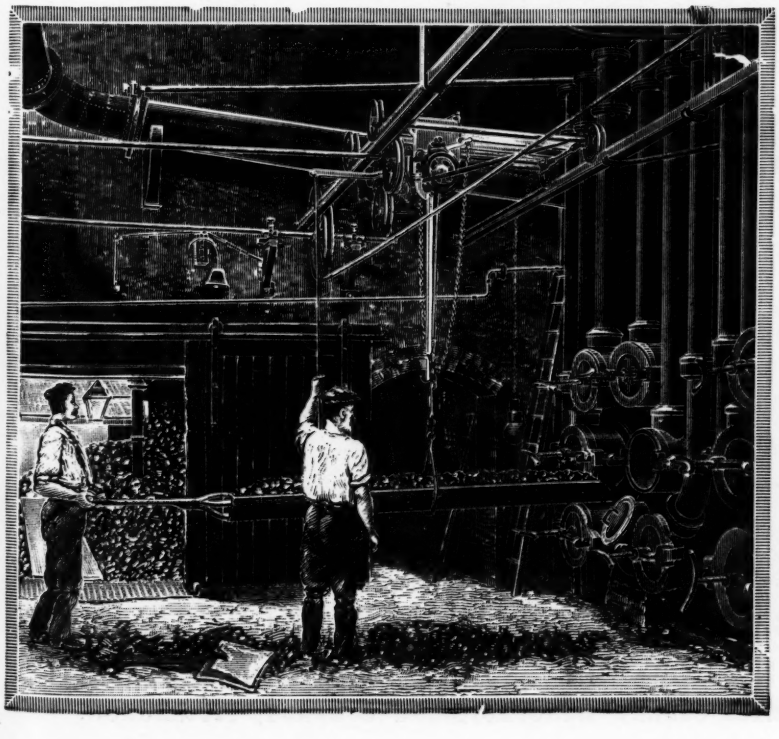

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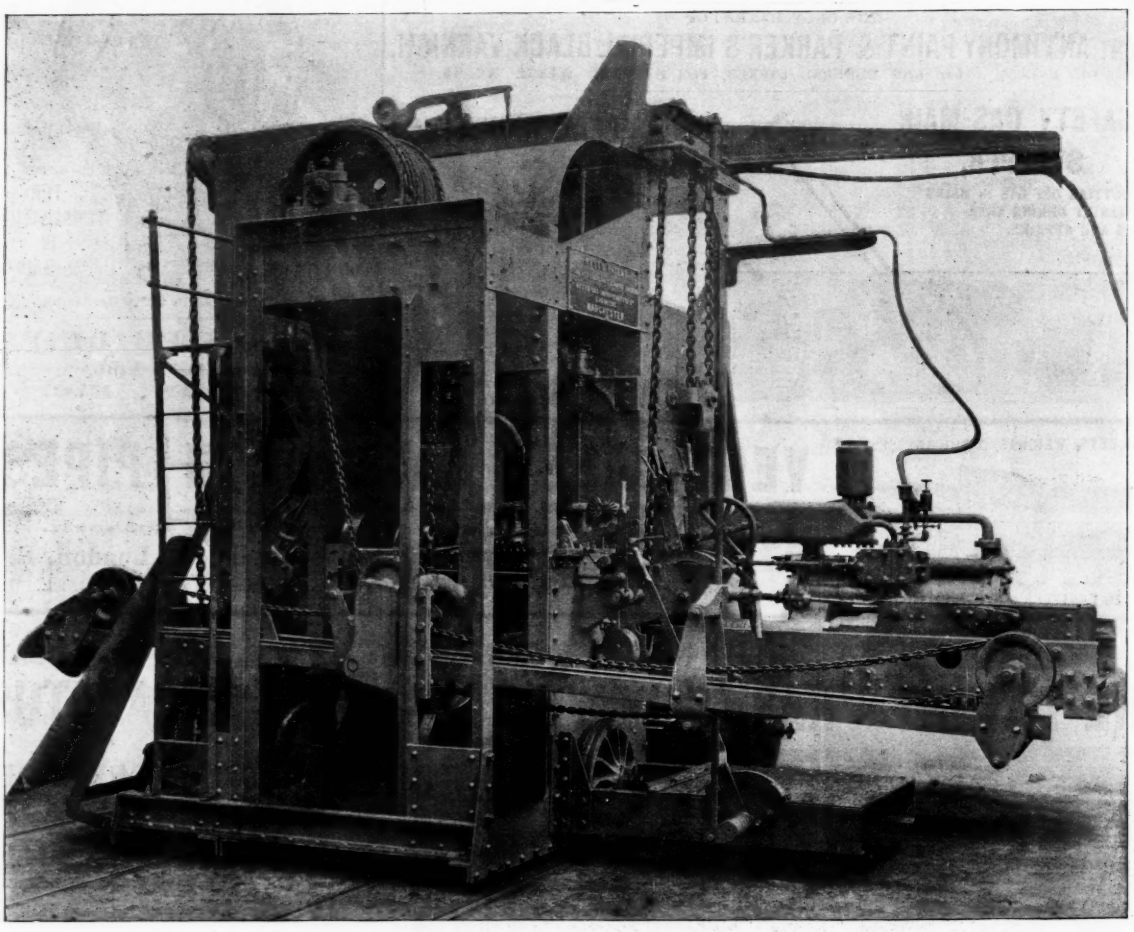

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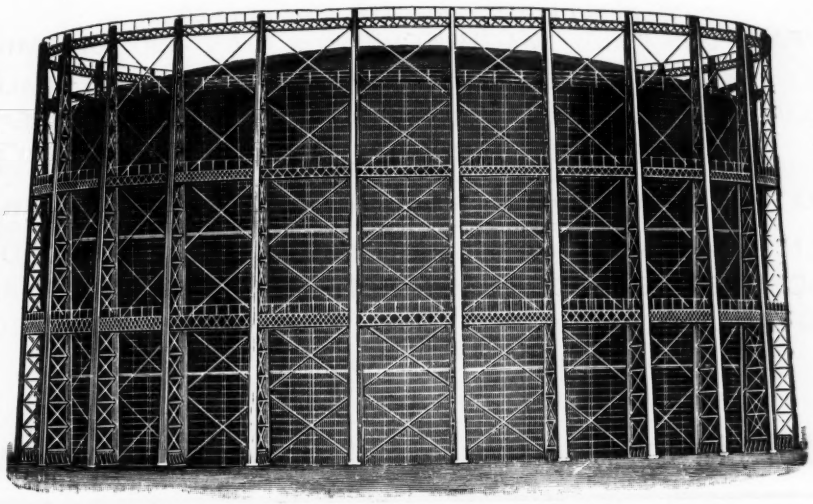

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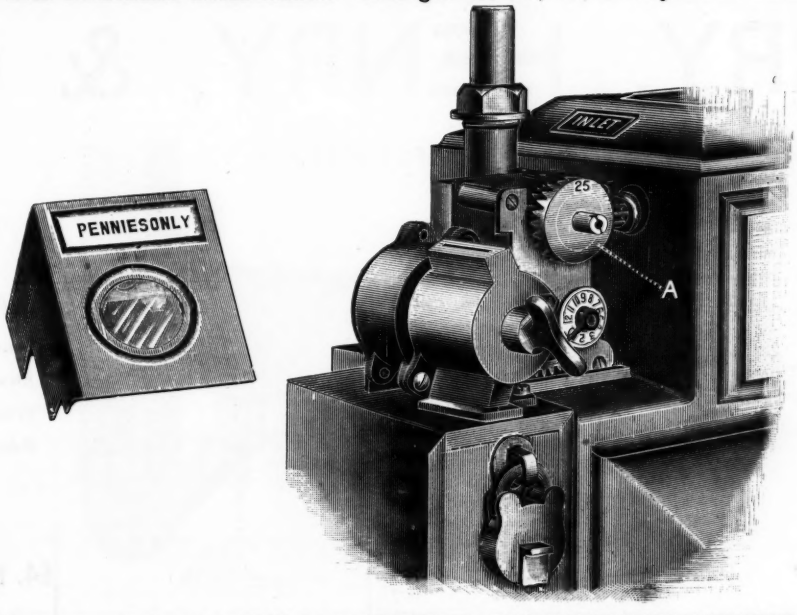

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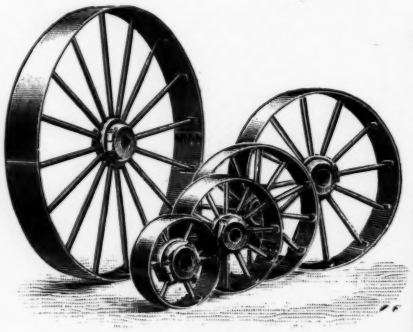

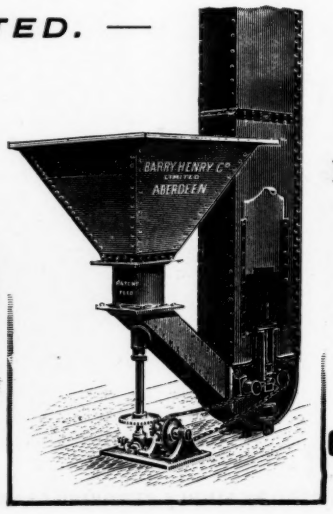

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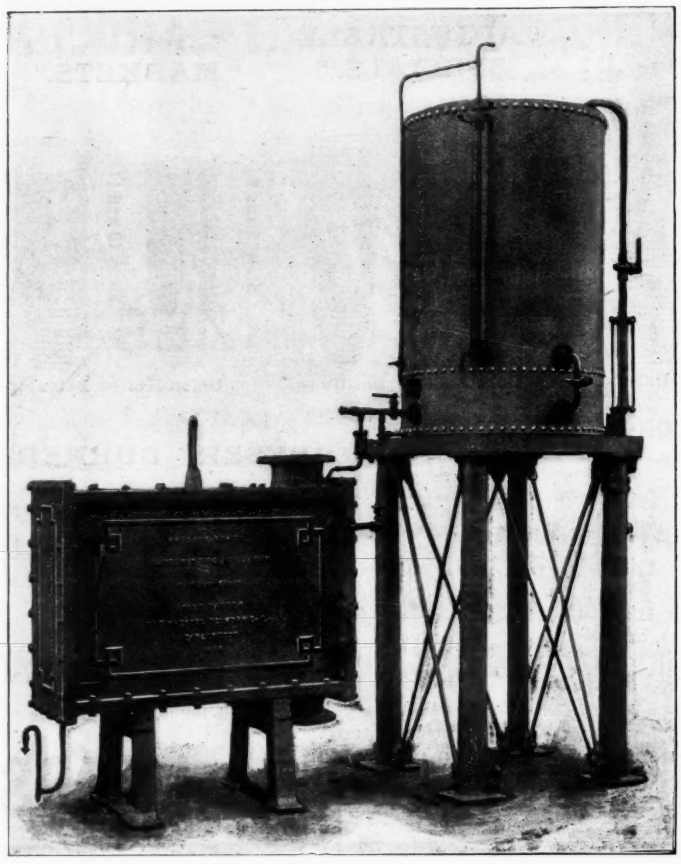

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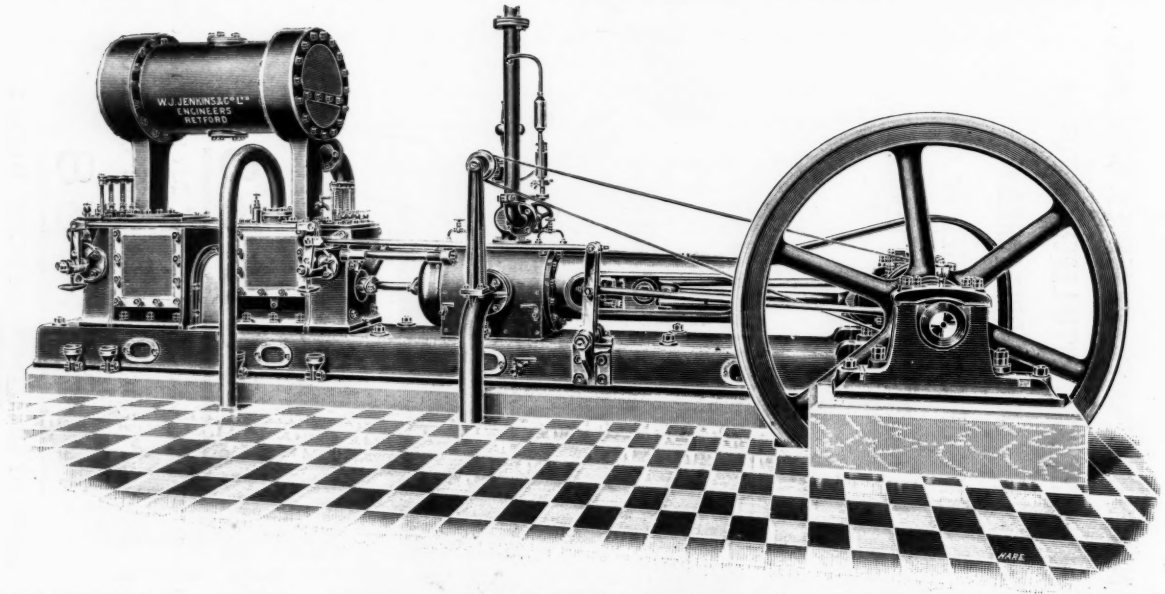

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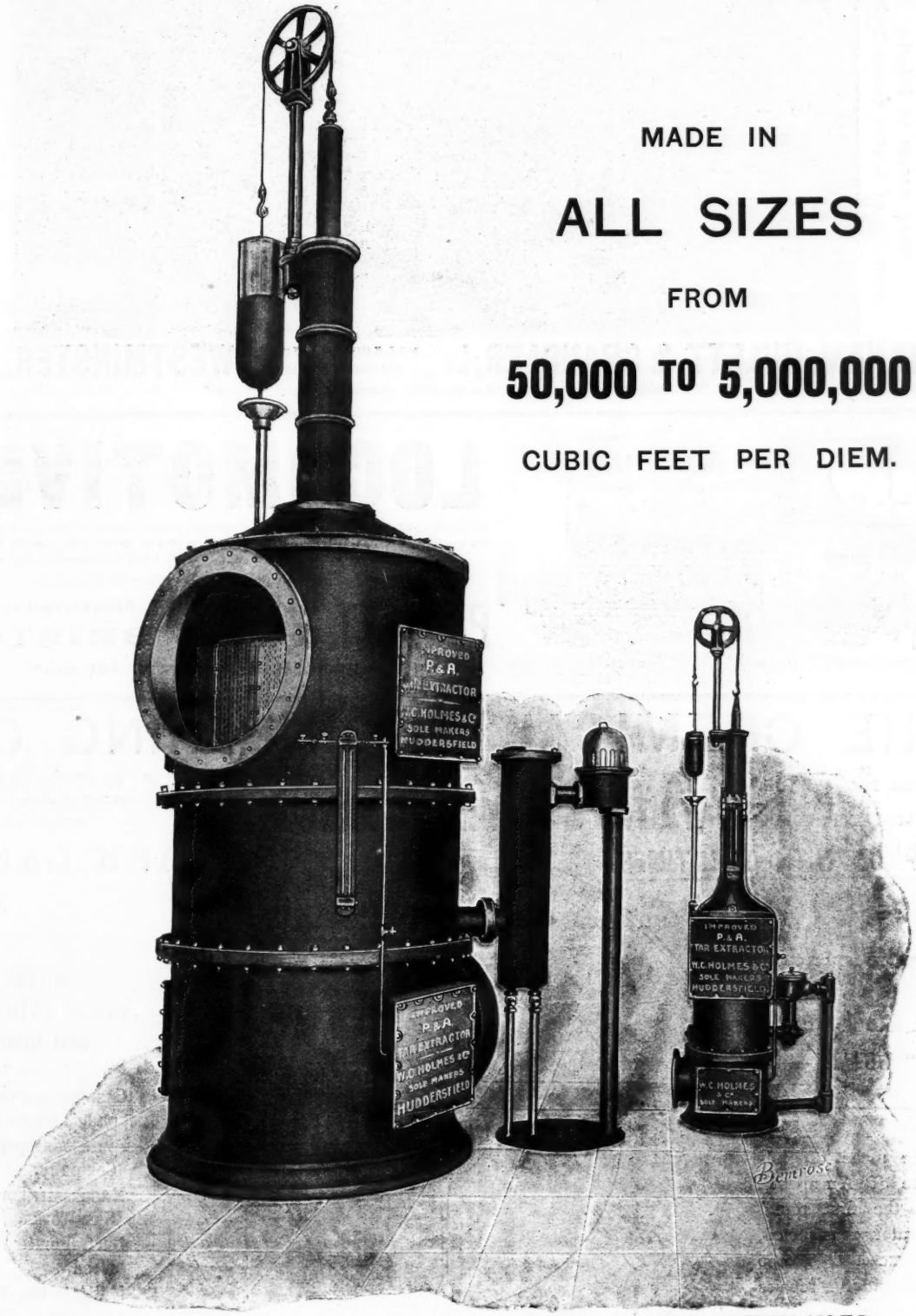

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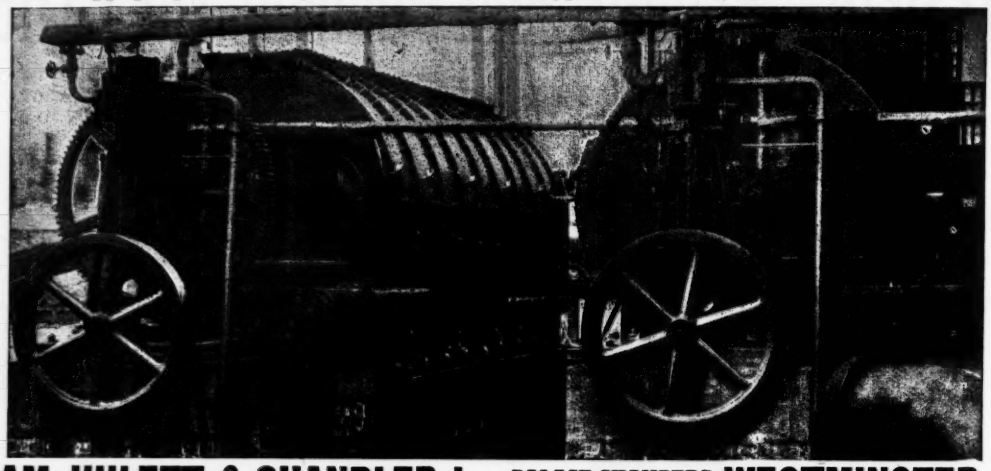

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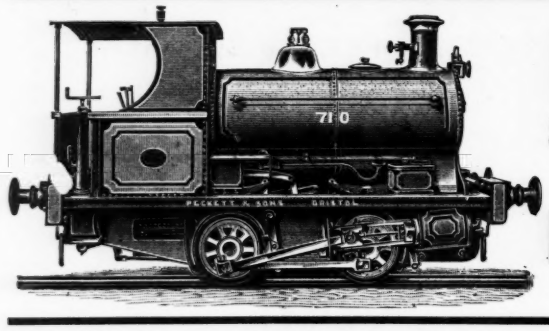

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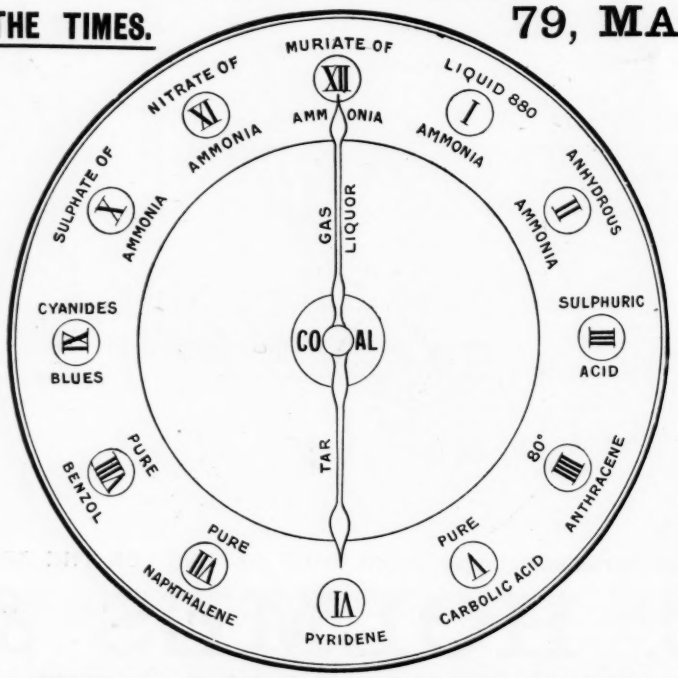

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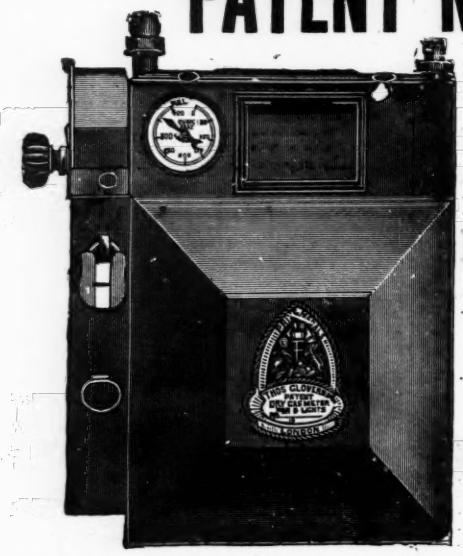

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VOL. LXXXI., No. 2072.—TUESDAY, JANUARY 27, 1903.

EDITORIAL NOTES.

The Law of Main-Laying—An Ilford Case.

THE time is surely ripe for some competent person to cast into a concise and intelligible body of law the multitudinous conditions and obligations under which authorized gas undertakings enjoy and are able to exercise the privilege of using the public streets and thoroughfares for their distribution work. The privilege takes its origin, as everyone knows, in the Gas-Works Clauses Act, 1847; and it is to be feared that the knowledge of many does not go much farther. The main-laying provisions of this Act are constantly being cited in modern Acts, and are often extended to cover developments not contemplated in the original—such as the laying of mains in undedicated roads, the laying of mains for ancillary purposes of gas supply, and the similar use of roads outside the area of the undertaking. Some gas companies possess all these facilities; while others have not had any opportunity for obtaining them. There is even greater variety in the conditions attaching to the exercise by gas undertakings in the United Kingdom of the powers in this regard which have been conferred upon them. Indeed, there is scarcely an important gas company without some peculiar obligation of this kind; and the tendency is for this special legislation to be made more particular and exacting. It is a far cry from a quiet rural highway to a brand-new example of roadway engineering in the heart of the Metropolis, with all the latest improvements in the shape of subways; and there is a growing feeling that the main-laying operations and law which were originally devised for the one are scarcely adequate to the case of the other. Yet the law is essentially the same all over England; and such local differences or accretions as there are have been engrafted upon, without annulling the purpose of, the Act of 1847.

It is, however, in respect to the bearing of other than gas law upon the main-laying privileges of authorized gas undertakings that the greatest degree of complexity has arisen. When the ordinary gas manager has learnt pretty thoroughly and accurately what he can and what he cannot do to the roads on his own special account, he has not half mastered the law of highways as it behoves him to know it. All sorts and conditions of other people have equal privileges of the same kind as the gas manufacturer; and perhaps the most troublesome of all in this peculiar copartnery is the tramway interest. Since the beginning of the modern phase of tramway enterprise, which is identified with the application of electric traction, the outdoor cares of the gas manager have been vastly increased. Numerous novel points of law have arisen in this way, not to mention the greater number of difficulties of practice which have been smoothed over by the usually prevalent good-will between the parties. For, although those who are responsible for the safety of gas mains and services laid in the public highways have been very sorely exercised as to the possible effects of the new system of tramway traction upon a class of property the deterioration of which implies unknown dangers to the public, it is only fair to remark that they have not been unreasonable in this regard. Emergencies have arisen, however, which could not be dealt with on the spot; and a prominent instance in point was the difficulty at Ilford.

The facts here were simple. There was an old gas-main in a thoroughfare along which the District Council laid a new tramway, and did it in such a fashion that the Company could not carry a service-pipe from their main across the line to supply an intending consumer who had demanded such supply. Thus there arose that conflict of rights which is commonly held to be the essential element of tragedy. In the circumstances, the Gas Company served a notice upon the District Council, requiring them, in effect, to get out of the way. This meant altering the position of the whole of the gas-mains in the thoroughfare for a length of some 2½ miles. The Council demurred to the request; and the Company consequently applied in proper course to the Board of Trade to appoint an Arbitrator to dispose of the question. The arbitration was held; and the award adjudged that the gas-mains laid antecedently to the making of the tramway should be lowered, so as to admit of the service-pipes being carried across the road, where necessary, at a sufficient depth to avoid cutting through the concrete foundation of the tramway. Where the gas-main came underneath these foundations, or so near as to prevent convenient access to the main without interfering with the tramway, the main was to be moved laterally.

This was an award in favour of the Gas Company; and the District Council were dissatisfied with it. Accordingly, they moved the High Court to have it set aside for several reasons, the principal objection being that the Arbitrator had exceeded his authority. In support of this, the legal point was taken that the demand of the intending consumer, which the Company had been unable to supply, was made subsequently to the construction of the tramway, and was therefore a "future" case that had arisen after the rights of the tramway authority, whatever they were, had accrued to them. The words of the Act are that "before" laying down a tramway, &c., notice must be given to a gas company, who are thereupon entitled to require such alterations of mains as they may consider necessary. The point is quite distinct. Here the necessity had arisen after the making of the tramway, and the Arbitrator had dealt with it as he admittedly might have done if it had occurred before the commencement of the tramway construction. In this, the Council contended the Arbitrator had exceeded his authority. Without calling on Counsel for the respondent Gas Company, the Court upheld the award. In giving his judgment, which was instinct with common sense, the Lord Chief Justice pertinently asked what the gas-main was in the road for. Of course, it was there to supply gas by means of service-pipes. These have to be laid in a proper manner, which could have been done perfectly before the tramway was made, but not afterwards. If this was not such an interference with the proper use of the gas-main as the Tramways Act was intended to deal with, it is difficult to imagine of what value the Act could be in this respect. The Court had not to review the findings of the Arbitrator, but only to say whether or not he had jurisdiction over the matters referred to him. This question has been affirmatively answered, which is something to be very thankful for in the interest of gas supply. The position of gas undertakings in regard to new tramway constructions will be greatly strengthened by this valuable precedent—one of the most important of the kind that has been created under the law of tramways.

Mr. Johnson, L.C.C., Replies to Sir George Livesey.

IN another column will be found a statement voluntarily made to a representative of the "JOURNAL" by Mr. W. C. Johnson, of the London County Council, as a personal reply to Sir George Livesey's "open letter" upon the subject of the Sunday testing of London gas. Mr. Johnson begins by disclaiming any intention of making a personal attack upon Sir George Livesey, by the expressions of which Sir George complains. This is what might have been expected in the circumstances; but perhaps the incident will serve to warn the perfervid orators of the London County Council not to indulge in imputations of dishonesty, nor to expand in wild rhetoric when they discuss the doings of those with whom the Council have business dealings. Mr. Johnson now gives a somewhat belated denial of agreement with "the man "Ward" who talked of the "cheating" Gas Companies; but he cannot deny having said himself that the question of Sunday gas testing was whether or not the people of London were to be "poisoned" on that day. As between the alternatives of being merely cheated or poisoned, the choice certainly does not appear to be doubtful; so that if Mr. Johnson was not, as Sir George Livesey "audaciously" inferred that he was, in agreement with Ward, it must only

have been because he wished to charge the Gas Companies with a more serious crime than cheating. If he did not mean anything of the kind, he should have moderated his language, and not have allowed his tongue to run so fast and far. Mr. Johnson must be left to his study of dictionaries in search of justification for his wild language; but that this exercise should be regarded as necessary is no credit to the speaker's discretion. Men who respect one another, and desire to continue in the same way, do not want dictionaries to explain themselves. Mr. Johnson is probably genuinely astonished that Sir George Livesey should take personal notice of the aspersions flung about so heedlessly by himself and his colleague Ward. He wants a sharp reminder, such as he has received, that things are not done without doers. A thievish gas company implies roguish directors; and gentlemen who happen to be responsible for the policy of public companies cannot dissociate their own reputation from that of the undertaking with which they are identified. Perhaps if the respectable members of the London County Council were to drop that sort of talk altogether, they would be able to serve the public quite as well as though they continued to use language which might perhaps be pardoned in some other walks of life. In ordinary business, people do not usually refer to those with whom they have to deal in the terms some members of the London County Council seem to think permissible in relation to Gas Company directors. Why should lack of manners be any more excusable in the elected at Spring Gardens, "dressed in a little brief "authority," than outside this body? Let them remember they do not possess a monopoly of public virtue, and that the less they abuse others and protest their own immaculate devotion to the public interest, the readier people will be to give them credit for meaning well, however clumsy their performances.

An Unfulfilled Reference.

Once more the columns of the "Journal" have disclosed the necessity for some systematic and acceptable scheme for stating carbonizing costs; and until there is a recognized unification of methods, we cannot hope to escape from the confusion and disagreement which now cover controversy and published statements in which the merits or otherwise and costs of machine-stoked horizontal retorts and inclined retorts are opposed. We have only recently seen the tangle into which our American friends got themselves over that mootable question of "Why Milwaukee did not Build "Inclines." In that discussion, Mr. Littlehales' remarks illustrate the deceptive appearance that can be given to the subject of an argument by adopting incomparable bases; and his attack on the working at Edinburgh has impelled Mr. W. R. Herring to address a correcting letter to the Editors of the "American Gaslight Journal." This letter (as we published the observations in question) we reproduce elsewhere in the present issue. The correspondence, too, which is now proceeding in our columns on "Inclined *v.* "Horizontal Retorts," and which was incited by the statements contained in the recent notice of Mr. John West's new combined charging and drawing machine, is another case in point. And until a uniform method of stating costs is adopted, the advocates of the two systems will be constantly running athwart each other over the mere radical principles on which debate on the subject should proceed.

Many men have tried their level-best to give the world exact information as to what are their working costs for inclined retorts. But there is rarely an attempt made in this connection that is not challenged from one direction or another, and simply because local circumstances and engineers' views as to what should be comprised in the costs so largely differ. Long before the advent of the inclined system, engineers were frequently protesting against their costs being set in comparison with other places for much the same reasons; and then almost precisely the same differences presented themselves as are presented now in many comparisons between horizontal and inclined working. We have pleaded before for an attempt being made to codify the rules on which engineers proceed in making their comparisons; and Mr. Herring, at the annual meeting of the Institution of Gas Engineers last year, also offered a strong argument in favour of uniformity in the methods of stating the items comprising carbonizing costs. He then suggested that the ton unit should be the basis of comparison; and his last reference to the subject shows that he still clings to that as a safe and applicable meter of carbonizing costs. He writes in his letter to our American contemporary: "The point at issue is as to the relative costs involved in "labour in manipulating a ton of coal from its receipt at "the retort-house to the discharge of the coke and the refuse "therefrom into the yard. . . . To avoid the slightly "varying rates for wages in different localities, the figures "might be stated in tons of coal manipulated per man per "day of a given number of hours' work."

At the Institution meeting, Mr. Herring did not ask for this proposal to be accepted forthwith as a rule, but he urged the appointment of a Committee to consider the whole question. The upshot of the meagre discussion of his paper was that the matter was referred to the Council, with authority to appoint a Committee for the purpose of devising a plan. It is well perhaps to recall the fact that Mr. Charles Hunt seconded the proposed reference in the form here stated, and that it was unanimously agreed to. But there is no indication that anything was done by the Council in the matter; and they and the Institution have been merged in the larger organization. The work has been left undone; but we hope that the Council of the new Institution will regard it as worthy of attention and completion. It is a question that could be taken as a legacy from the old Institution, and appropriately form an item of the programme for the first annual meeting of the new one. Even without formal introduction in the nature of a paper, there would, we undertake to say, be a fruitful discussion.

Progress in the South Wales Negotiations—Hope of a Peaceful Settlement.

Since last we mentioned, three weeks ago, the negotiations that are proceeding at Cardiff between the South Wales coalowners and their employees, numerous meetings have taken place of the Joint Committee to which the settlement of a revised wages system has been entrusted; but until Saturday last practically no progress had been reported. The official report of this last meeting, however, indicates that the two sides are getting somewhat nearer together, and are at length coming to grips with some of the essential points at issue. It has been practically decided that the question of direct payment for "small" coal—which is at present paid for indirectly, in the rate paid for "large"—shall not be pressed by the miners, a clause having been drafted for inclusion in the new agreement (if one is eventually arrived at) to protect the owners from any claim in respect of "small" coal gotten. This removes what was by some people thought to be one of the most serious difficulties in the way of a friendly settlement. Then the vital question of the minimum wages rate has been advanced considerably. The miners originally asked that it should be fixed at 40 per cent. above standard—that is to say, they proposed that, when the average price realized for coal fell to 12s. 6d. per ton f.o.b., or less, wages should be fixed at not less than 40 per cent. above standard. The owners, on the other hand, proposed that the minimum should not be reached until coal fell to 11s. per ton, or less, and that then the rate of wages should not exceed 16½ per cent. above standard. There was thus, it will be seen, a wide difference between the two sides.

It is now reported that a memorandum has been drawn up, whereby both parties agree to accept 30 per cent. as a minimum; but whereas the miners claim that wages should not be reduced to that rate until the average price of coal falls to 11s. 3d. per ton—which is in accordance with the sliding-scale agreement that has just expired—the owners claim that they should not be required to pay more than the minimum rate after the average price has fallen as low as, or lower than, 12s. 3d. per ton. They claim this advantage on two grounds: First, that the cost of production in South Wales has materially increased since the defunct sliding-scale agreement was entered into; and, second, that, in view of the past record of wages paid under the old agreement, they are making a very great concession in agreeing to pay never less than 30 per cent. above standard. It has been agreed by the joint representatives that the difference of 1s. per ton between them shall be referred to the arbitration of some "independent person," not named. Considering the material concession the owners are undoubtedly making to the men in accepting so high a minimum rate

(the fact may be recalled that wages have only exceeded 20 per cent. above standard in eight of the past twenty-three years, and have been as low as 2½ per cent.), we are very much surprised that they did not insist upon the *quid pro quo* of the higher selling price equivalent, as an absolute condition of their agreeing to such a minimum rate. We do not believe the men would have withstood the claim if they had been made to understand that the owners meant "business." But, unfortunately, the owners have all along taken up a "squeezable" attitude, which is both undignified and dangerous in negotiations of such a character.

The owners, it should be added, have required it to be distinctly understood that this arrangement respecting the minimum wages rate—which, it may be remarked, is the same percentage above standard as prevails in the Federated districts of England—has only been agreed to by them on condition that a satisfactory agreement is arrived at upon other questions outstanding between the parties. These include the questions of: (1) The maximum wages rate; (2) the constitution of the Conciliation Board; (3) an immediate reduction in the rate of wages payable—at present it is 48¾ per cent. above standard; (4) the price to be paid by the colliers for their house coal; and, finally, (5) the period for which the agreement to be entered into shall last. There is room here, of course, for an eventual failure to arrive at an amicable settlement; but we cannot help feeling and hoping that, with so satisfactory a concession in their pockets on the minimum wages question, the miners will not take up an "impossible" attitude on any other point. We think it is fairly evident that neither party now wishes to precipitate a struggle; and if that be so, there is little reason to fear that one will be brought about, so to speak, "by accident." At any rate, the outlook is more hopeful than it was at the end of the year.

The Labour Topics of the Week.

THERE is nothing to be said this week about the Denaby miners' lawsuit against the Trade Union, the decision of the Court not having yet been given. Meanwhile, a good object-lesson on the expediency of having these semi-political labour questions dealt with in the calm air of a Court of Law, and not by prejudiced persons, has been furnished by the inconsequential treatment of certain aspects of the Bethesda business by a Carnarvonshire Police Committee. In its composition, this Committee resembled that of too many Parliamentary Committees who have been charged with the investigation of a *quasi*-political matter, being made up of unequally balanced members of opposite parties. The result, of course, was similar. All the men who were of one shade of political opinion concurred in finding that the blame should be attributed to one quarter; and the others joined in an independent report expressing contrary views. Thus the signatories of the majority report of the Carnarvonshire Police Committee in regard to the trouble of Bethesda were impressed first and last with "the extent of "the strife and bitterness engendered by this quarrel;" but they did not say who was in the right. In this they resemble the common politician, who habitually favours the dangerous error that whatever cause is apparently passionately held by a section of the populace must be just. Next, they hinted their displeasure at the actions of the police, who are accused of not sufficiently regarding the feelings of the strikers. This deplorable callousness of the constabulary to the sensitive roughs whose misconduct had called the police to the scene, was exhibited, according to these tender gentlemen, "in the exercise of what they conceived to be "their principal duty—namely, the protection of workmen "employed in the quarry." What other, in the opinion of these critics, should have been the conception of the nature of the police duty? The report breathes more sympathy with the strikers and rioters than with the cause of law and order. It is a pity the Committee were not on the spot at the time. The other report admits that rioting and danger to persons existed, and was dealt with wisely and well; but it agrees with the majority report in considering that the danger is past and the district settling peaceably down. Where the minority report differs most remarkably from the majority report is in condemning the conduct of the "Labour leaders," which is branded as having been insincere, and "certainly not conducive to the "maintenance of peace." Naturally, nobody mentioned the source and origin of the whole of the trouble, which was the coveting by the old staff of workpeople of the property of their employer, Lord Penrhyn. The "strife and bitterness" recognized by the majority of the Police Committee proceeds entirely from the disappointment of those who entertained this covetous desire, and failed to gratify it through the effective resistance of the owner of the property. There is an old nursery rhyme which immortalizes a parallel incident of Welsh life, and records a violent conclusion that must have been similarly attended with an acute degree of unpleasantness between neighbours.

Sir Frederick Bramwell on the Metric System.

THERE was great fun at last week's meeting of the Electrical Engineers, as might be supposed from the circumstances of Mr. James Swinburne being in the chair, and Sir Frederick Bramwell being on hand to oppose a resolution in favour of the compulsory establishment of the metric system in England. An unhappy individual—Mr. Alexander Siemens, no less—had most rashly undertaken to move the affirmative resolution, and he did so in a speech of more than common spirit and point. It is hardly necessary to say, however, that Sir Frederick Bramwell thoroughly enjoyed himself, and well entertained the company, by exhibiting the metric system as an artifice which has strikingly failed to make headway by its merits. English people have been at liberty these many years to make and mend, or buy and sell, by the metric system of weights and measures; but, as a matter of fact, they have not taken to it. The law of the survival of the fittest has certainly not favoured the system; and accordingly some of its most enthusiastic admirers now want to call in the aid of the law to enforce its adoption. We have on several occasions pointed out the awkwardness of the metric units and system in regard to gas supply. Sir Frederick Bramwell has distinguished himself before now by showing how impracticable mental calculations are by this system. On the present occasion, we desire to suggest to admirers of decimals for all uses the expediency of having some agreement as to how they should be written. Those who urge the adoption by the English people of the metric system, or at least of decimals instead of common fractions, usually forget that the English and French practices of writing the decimal point are radically different. Where we employ what we call the decimal point (·), which is a full-stop half way up the line of numerals, the French and other foreign users of the metric system either use a comma (,) on the line itself, or a full-stop (.) at the same level. But inasmuch as they also use a comma to mark off the thousands in large numbers, it is often doubtful, and sometimes impossible, to distinguish when a comma marks a decimal and when it does not. We encounter this difficulty frequently in French gas engineering treatises; and similar cases in point will occur to habitual readers of foreign technical memoirs.

Backwardness of Electric Power-in-Bulk Schemes.

BRITISH gas companies will have good reason to be thankful when some of the large electric power distribution companies that have been granted statutory facilities for carrying on their proper business in different parts of the United Kingdom really get to work, and show what they can do. In a recent issue of an electrical journal, a supplement table was inserted which purported to give particulars concerning the large Electric Power Distribution Companies in this country "working" under parliamentary powers. It was confessed that the only one of these companies which is really in active operation is the Newcastle-upon-Tyne Electric Supply Company; and this is the concern which is proposing to take over the electric power branch of the Walker and Wallsend Gas Company. With this exception, these electric power schemes are long in getting to work. The Midland Electric Power Corporation are credited with having a finely-equipped works and an extensive distribution system; and our contemporary expresses the pious hope that it will soon be "working with economy on a "heavy load." So do we. It is indeed high time that this spoon was made or the horn spoilt. Some of these power distribution companies have been "going to begin" for quite a long time. As our informant gently puts it, "the remain-"ing power companies are either working under more or "less temporary arrangements, or are still in the earlier "stages of their development." When it comes to the

pinch, people are not so ready to venture their money on the chance of getting a profit on the supply of electric power at a penny per unit or thereabouts. It is most pathetically remarked that this backwardness is stopping the procession, seeing that some of these companies have staked out a very considerable field in the matter of "bulk" supply to local authorities holding Provisional Orders, who are awaiting the cheap supply which has been promised them before proceeding to make use of their own powers. Let us hope they will not grow tired of waiting. We have more hope of the South Wales Company of this order than of some others. This is a venture which is very well supported locally, and is engineered by Messrs. Bramwell and Harris. It is likely to do a considerable trade; and if it lives it should prove highly useful in checking the vagaries of the local authorities' electricity supplies which compete with gas power by selling under cost. These independent undertakings, that is to say, will show exactly what an electric power connection costs to run; and the most ardent municipal advocate for trading at less than a fair price will scarcely then be able to defend such performances as we have had occasion to condemn in the case of Newport.

The Use of Fans in Gas-Works.

There appears in another part of the "JOURNAL" to-day the first of a series of six plentifully illustrated articles dealing with the application of fans to the various purposes for which they are required on a gas-works. It is intended, should space permit, to publish the remaining five parts one in each alternate issue, so that in this way readers will have at least a fortnight to study each article as it appears. This will probably not be found to be any too long, for the author, Mr. R. Gordon Mackay, Assoc.M.Inst.C.E., has given a very great deal of time and trouble to the investigation of the important subject with which he deals, and the results of his labours are not to be assimilated by means of a cursory glance down what he has been at such pains to write. However, the articles are well worthy of careful perusal—containing, as they do, a very large number of facts and formulæ relating to air and gas moving machines, many of which have been arrived at through experiments at the Hornsey and South Metropolitan Gas-Works. Part III. will be found specially interesting, as it deals with the use of fans for gas exhausting—a matter of increasing importance as the advantages of distributing gas at a higher pressure than was heretofore customary are coming to be more extensively recognized, and one, moreover, with regard to which there is at present no very great amount of literature available. The subject of fan engineering generally is coming more to the front now; and this treatise will be a great aid to all those who are wishful to add to their knowledge of this branch of the profession. Mr. Mackay is not altogether a stranger to our readers, for he a short time ago wrote for the "JOURNAL" a valuable article on the closely-allied subject of the "Vitiation of Air in Gas-Works." The recollection of his previous communication, and these appreciatory remarks, will, we trust, secure for Mr. Mackay's present contribution the attention it so amply merits.

The Value of Cyanides.

The articles on the subject of "The Gas Industry and the Manufacture of Cyanide," by MM. Robine and Lenglen, translations of which from the French have been appearing in the issues of the "JOURNAL" this month, should at the present time be of particular interest to our readers. Of recent years considerable attention has been paid by many engineers and chemists both in the United Kingdom and Germany—and in the front rank of these enterprising men may be mentioned the name of Mr. William Foulis, of Glasgow—to the question of the extraction of cyanides as bye-products in the manufacture of illuminating gas. But France has, for some reason or other, fallen behind in this matter. She is not, however, likely to remain so for long; and even in this country the subject will no doubt shortly command a very much larger amount of attention from gas engineers generally than it has hitherto received. Thus will another soon be added to the already many essential qualifications of men who desire successfully to manage a gas-works of any magnitude. No time should, therefore, be lost by them in learning all that is to be learnt regarding the utilization of the cyanogen compounds which come ready formed in the course of their ordinary operations. Previous to the shutting down of the South African gold mines on account of the late war, very large quantities of cyanide of potassium were employed for the treatment of the ores; and now that things are settling down again in that part of the world, the former demand will not only be renewed but greatly exceeded. The hampering restrictions and the corrupt practices of the old *régime*, which did so much to retard the proper opening up of the country, have now been for ever swept away; and the existing proved mines of the Transvaal will doubtless form but a small proportion of those which will be working within a no very long period of time—to say nothing of other parts of Africa, prospecting in which will be stimulated by the altered condition of affairs within Paul Kruger's late dominion. All this foreshadows a ready market for cyanides; and it is to be hoped that England will secure at any rate the major portion of the business. The articles by MM. Robine and Lenglen form an excellent record of what has hitherto been accomplished; but everything has not yet been said upon the subject. Active minds are still busily engaged upon it; and there is now in preparation for publication in an early issue of the "JOURNAL" an account of the results of further important investigations.

Commission on the Photometry of Incandescent Lights.

We had almost despaired of anything good emanating from the proposal so heartily accepted at the first session of the International Gas Congress in Paris in September, 1900, that an International Commission should be appointed, by the Congress Committee, to inquire generally into the question of testing incandescent burners and mantles, in order to arrive at a correct standard of determination and comparison. At the time, in our report on the proceedings of the Congress, it was remarked: "Although the names forming the International Committee give every confidence of an adequate examination of the subject, and although it may be hoped that their efforts will prove sufficient to give an impetus to the system of testing incandescent gas lighting, there are many pitfalls in their way to be avoided; and it is to be desired that the result of their labours will not be diminished by lapse of time and extraneous causes as is often the case with similar commissions of inquiry." It has been a regrettable circumstance to many that the covert expression of fear contained in these words—which were penned in Paris within a few hours of the passing of the resolution and the reading of the papers by Dr. Bunte and MM. Stœcklin, Rieder, et Cie., which suggested the inquiry—has been in large measure justified by the length of time allowed to expire before any real move has been made to give effect to what was at the time felt to be genuine, praiseworthy, and useful intention. Nearly two-and-a-half years have been spent, and nothing definite has been done beyond (it now transpires) giving form to the preliminaries. The information is only now to hand that the necessary appointments have been made and the lines of inquiry practically settled; but still not so inflexibly that further suggestions will not be welcomed by the Commission, whose official address, it may be well to mention, will be the office of the Société Technique de l'Industrie du Gaz en France, 105, Rue Saint Lazare, Paris. It is evident that the Commission intend and desire the inquiry to be as comprehensive as possible; and we hope our readers will assist them in making it so. The period that has been allowed to elapse before this outward sign of action is made is one in which tremendous progress has been made in the adoption of incandescent gas lighting, and so much valuable time has been lost. But now it may be hoped that the work that will be accomplished will, in substance and value, set aside all regret that the delay has caused. In extenuation of the slowness of movement, it must be recognized that there are many difficulties in the way of getting together an International Commission of this kind; but, in a matter such as this, where the results will unquestionably have an international value, some sacrifices should be and must be willingly made all round. We have faith that the men who conceived, organized, and carried to such a successful issue the Congress of 1900, will succeed in the work to which they have now set their hands. Any aid that the "JOURNAL" can give will be gladly rendered.

A Change of Policy at Burslem.

It will be seen by the report which appears in another column that the Burslem Town Council have lately sanctioned an important change of policy by the Gas Committee. The reasons for the change were clearly stated by Mr. Wade, upon whom, in the absence of the Chairman of the Committee (Mr. E. Leigh), this duty devolved. He was able, however, to assure the Council that Mr. Leigh was thoroughly convinced that the adoption of the new policy was the wisest and best course which could be taken in the interests alike of the gas consumers and the ratepayers. The Committee found themselves face to face with a large additional capital expenditure on the undertaking, which had only been to a limited extent remunerative, and they tried what liberality would do in order to improve the position. Free supply of cookers, free public lighting, abolition of meter-rents, a preferential rate for the large consumers, special consideration of the needs of the artisan and the labourer in the matter of the slot-meter charges—all these were tried, but did not prove so productive of good results as had been anticipated. The Committee, therefore, like good business men, decided to review the whole position. The result has been that they find that the gas-stove—keenly desired at first—soon becomes neglected; that the preferential rate, which they thought would be a welcome innovation, only causes friction in the town; that the remission of the meter-rents had not been satisfactory; and that the slot-meter system is very expensive. Moreover, they have come to the conclusion that to defray the cost of the public lighting out of the profits realized by the sale of gas is inequitable, inasmuch as, being incurred for the general convenience, it ought to be made a common charge to be borne by all. They recognize that the gas undertaking is not a philanthropic enterprise to be carried on for the benefit of one section of the community at the expense of another; and they recommended the various changes set out in the report. These were evidently regarded as perfectly reasonable; for, so far as we can gather, not a dissentient voice was raised to them. The ordinary consumers will now pay 2s. 8d. per 1000 cubic feet, with a discount of 2d., and the slot-meter consumers 3s. 4d., with 4d. discount (inclusive of meter-rent); the charge for gas-engines being 2s. 6d., less 2d. discount. It is to be hoped that the new policy may prove to be of permanent benefit to the gas undertaking.

Municipal Financing at Plymouth.

Plymouth continues to furnish the shining example of a Progressive municipality struggling with adversity. It has got its affairs into such a state of financial muddle that it hardly knows where to turn for relief. For years past the Corporation have been piling up expenditure on "improvements," some of which are of doubtful value, while others are luxuries which the town could have done without until it could afford to pay for them. But it is found easy to borrow, and it has been thought only a sign of timidity and pedantry to count the cost, until now matters have reached such a crisis that Parliament is to be appealed to to grant relief. The Corporation are promoting a Bill in the next session, which, as drafted, was intended to confer on them very large and drastic powers in connection with the numerous undertakings in which they are engaged or propose to develop. The main object of the Bill—practically now its only object—is to obtain an extension of the time allowed for the repayment of a portion of the municipal debt. It is argued that thirty years is too short a period to allow for the purchase of freehold land and buildings; and Parliament is to be asked to extend this time to sixty years in the case of existing loans, and also to consent to a scheme of equation of the municipal debt. Should Parliament agree, the ratepayers will obtain immediate relief of the rates to the extent of about 5d. in the pound. Probably this would prove a very transitory advantage, for new expenditure would quickly swallow up any gain which might come in this way, while the ultimate effect of shifting the burden on to the shoulders of a future generation would be to cost the town an extra half million sterling in interest.

Will Parliament Sanction It?

Whether or not Parliament, as trustee for posterity, will consent to the scheme, remains to be seen. It is true that the Select Committee who considered the question reported in favour of an extension; but the Town Clerk, though he is the author of the present scheme, seems to have serious doubts as to whether effect will be given to the recommendation. That it would stand no chance at all with the Police and Sanitary Committee of the House of Commons seems clear. There were originally included in the Bill several proposals relating to streets and sanitary matters, many of which were useful and necessary; but they have all been ruthlessly cut out. The Town Clerk frankly told the Council that "the Parliamentary Committee which he wished to avoid in the promotion of the Bill was the Police and Sanitary Committee. If these clauses were retained, he feared the Bill would go before that Committee; and this would jeopardize the main principle with regard to the extension of the time for repayment of loans and the relief of the rates." So all the sanitary provisions of the Bill, and much else, were jettisoned, and attention is to be centered upon this one idea of getting more money by postponing the payment of the debt. Among other things which went overboard was a clause by which the electric light and electric tramways were to be dealt with as a joint account. The explanation of this proposition was that if the two undertakings were treated in this way they would come wholly under the jurisdiction of the Board of Trade, instead of being partly under that of the Local Government Board; and the capital expenditure on the electric light works would not count against the borrowing powers of the Corporation. Perhaps it was feared that Parliament would not sanction so flagrant a proposal for increasing the muddle into which municipal accounts so easily get; but, whatever the cause, the clause was quietly dropped.

Another Workmen's Compensation Act Curiosity.

Our very outspoken contemporary the "Financial Times" has been one of the most severe critics of the much-abused Workmen's Compensation Act; but now it has turned its attention to the Judges whose duty it is to decide cases arising out of the provisions of the measure. When referring last week to a particularly absurd decision, the writer remarked that, although the Act was a triumph of obscurity and bad drafting, there was no need for the Judges to so often divest themselves of ordinary intelligence when set to interpret its meaning. "Doubtful points should be decided, not by the rules of mechanical grammar, but by the presumed intention of those who framed the statute; and, when this is not clear, common-sense and fairness should be taken as guides." This, it is admitted, is usually done by the House of Lords; but the inferior Courts are far too apt to take the pedantic instead of the equitable path. It seems that one of the points on which a final appeal is greatly to be desired is the meaning of the term "average weekly earnings." Of course, where a man has only been employed a very short time, some apparent injustice may be unavoidable, seeing that a proper basis for calculation is not available. Where, however, a man has been earning the same hourly pay for an unbroken period of four weeks, it does seem to the lay mind that there should not be any difficulty in deciding what are his "average weekly earnings." This only shows how little the ordinary person knows about the matter, for the amount of compensation payable in identical cases has been held to turn on the day of the week on which it is the custom of the particular firm concerned to pay their men. The following example is given to illustrate the real meaning of this extraordinary contention. Supposing two men, each getting 20s. a week, began to work in neighbouring factories at 6 o'clock on the morning of Monday, Oct. 1, and both were disabled by accident just at leaving-off time on Saturday, Oct. 27, the compensation payable in each case need not necessarily be the same in amount. One of the firms in question might pay on Saturday; and therefore the man employed by them would get awarded to him 10s. weekly as the half of his "average weekly earnings"—the £4 earned during the period mentioned being divided by four for the purpose of arriving at the weekly average. The other firm, however, might pay on the Friday, and in this case it is held by the Court of Session that the man who was engaged by them and disabled on the same day and at the same hour as the man who was paid on Saturday and awarded 10s. a week, had worked for three whole and two broken weeks, so that his £4 must be divided by five, making the "average weekly earnings" 16s., and the compensation allowance 8s. a week. Our contemporary very truly remarks that "this is an outrageous

position; and it is much to be desired that the absurdity should be put right on appeal, or by fresh legislation. There seems to be a little less illogicality on this side of the Tweed; but the above is the decision which apparently rules in Scotland by the united wisdom of the Court of Session." The judgment referred to certainly seems an almost impossible conclusion to arrive at; but then it must be remembered that this is not the first occasion on which the Court of Session has construed the meaning of "average weekly earnings" in a way completely at variance with common-sense, if unfortunately good in law.

GASLIGHT AND COKE COMPANY'S HALF-YEARLY REPORT.

THE following is the report of the Directors of the above Company for the six months ending Dec. 31 last, which, with the accounts (to be given next week), will be submitted to the proprietors at the half-yearly general meeting on the 6th prox.

The accounts for the past half year show that, after providing for the fixed charges, there remains a balance, including the amount brought forward, available for distribution, of £400,497 7s. 4d., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 8s. per cent. per annum; making with the dividend paid in September last a distribution for the whole year at the rate of £4 4s. per cent. The amount carried forward to the credit of the current half year is £65,146 19s. 4d., which compares with £64,834 12s. 5d. brought forward from the year 1901.

The quantity of gas sold during the half year was 10,319,472,000 cubic feet, or 43,800,000 cubic feet (equal to 0·4 per cent.) less than the quantity sold in the corresponding period of 1901, when the price of gas in the Company's district north of the Thames was 5d. per 1000 cubic feet higher than in the half year under review.

Comparing figures in the accounts for the past half year with those of the corresponding half of 1901, the cost of coal is again lower, and the prices of residual products have been fairly well maintained; also the manufacturing charges show a general diminution. The net result of the half-year's working is a reduced cost of gas to the extent of 4·6d. per 1000 cubic feet, while the net reduction in the average price of gas has been 4d. per 1000 cubic feet.

The Directors have deposited a Bill for raising additional capital, and, with a view to comply with the recommendations of Sir James Rankin's Committee of 1899, for reducing the standard price of gas fixed by the Company's Act of 1876, for providing for the redemption of obsolete capital, and for other purposes. The clauses of the Bill will be explained to the proprietors when, in compliance with Standing Orders, it is submitted for their approval at an extraordinary general meeting which will be held immediately after the close of the ordinary meeting.

The London County Council, acting in concert with the Corporation of the City of London, has also deposited a Bill having for its objects the application to this Company of the aforesaid recommendations, and, in addition, the compulsory reduction of the illuminating power of the gas supplied by this Company from 16 to 14 candles, coupled with a further reduction in the standard price of gas of 2d. per 1000 cubic feet. The Directors consider that the provisions of this Bill are unfavourable alike to the consumers of gas and to the Company, and that, under the circumstances, the course adopted by these authorities in promoting it is without justification. They have therefore decided to oppose the measure. Several other Bills adversely affecting the Company's undertaking have been deposited. These will be carefully watched with the object of securing all necessary protection.

The Court of Directors has been furnished by the several Engineers of the Manufacturing and Distribution Departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

Water-Gas Supply in Hungary.—The management of the gas works at Buda-Pesth contemplated erecting water-gas plant at Buda; but permission to do so was refused by the district authorities, the Magistrate, and finally by the Ministry of Commerce. The Chief Medical Officer of the town had protested against the erection of the plant on the ground that water gas was very dangerous. The Minister of Commerce, however, has since stated, in a circular-letter to the Municipalities, that he has had water-gas manufacture studied by experts, who advise that the system is perfectly reliable. Consequently, he says that in future a licence for the erection of water-gas plant must be granted; the question being, in his opinion, very important from an economical standpoint, because the Hungarian lignite or brown coal, which cannot be used for the manufacture of coal gas, is very suitable for the production of water gas. If works for the production of this gas are erected, it is possible that the Hungarian brown coal may even oust Prussian coal from Hungary for gas making.

ESSAYS AND REVIEWS.

THE TREND OF GAS INVENTION.

TWELVE months ago, as the result of a chance conversation, we interested ourselves, and have good reason for believing some of our readers, by making an analysis of the abstracts of patent specifications that had been published in the "JOURNAL" during the preceding year—in the first place, to learn whether inventors abroad had been greater contributors than inventors in the British isles or contrariwise; and, secondly, to ascertain the roads in which invention had been most prolific during the period to which the specifications referred. That is a good index of the direction in which men's minds have been principally turned in the matter of plant and appliance improvement. Now a comparison of last with the preceding year reveals some instructive points. Gas manufacturing and purification plant has received increased attention at the hands of engineers; and notices of patentable improvement have been of fairly frequent occurrence. In the lighting field, proposals for enhancing the efficiency of burners, mantles, lamps, lanterns, and so forth, together with burner attachments of various kinds, show a marked falling off—from abroad. With a revolution in lighting such as the incandescent mantle produced, as it became increasingly popular, so it was inevitable that it should have its wonder-working accompaniments; and the Continent produced an abundant crop. These are falling off; and such improvement as our patent specification register for last year chronicles is of a more pronounced and acceptable nature. Gas-engines, and their subservient plant and appendages, have had a renewal of prominence; but a study of the abstracts discloses that invention is estranging them more and more from coal gas, and seeking greater refinement and perfection in connection with the utilization in them of producer gas. There appears to be, for the time, a lessening interest among inventors in water-gas plant; but, quietly, the subject is one that is very much alive. Proposals for enhancing to the gas manufacturer the value, either by quantity or quality, of his bye-products have been anything but abundant; and, turning once more to the utilization of gas, we find that improvement in gas heating and cooking appliances has been almost dormant. On the other hand, the prepayment meter continues to strongly influence the attentions of workers. But taking a general view of the specification record for the past year, we are disposed to regard it with considerably more satisfaction than that of the previous year—both in respect of the quality and variation in invention, and the fact that the product of inventions in Great Britain has far exceeded that of the import from other countries, and so has reversed the condition of things that prevailed in our register of the previous year.

Examining the actual figures, we find that in the twelve months 240 abstracts of gas specifications were published in the "JOURNAL," which is a decrease of nineteen upon the previous year. But the little drop could well be suffered when we remember the character of a large bulk of the patents that presented themselves for notice in 1901. But whereas British inventors contributed 126 and inventors abroad 133 of the 259 specifications dealt with in 1901, the former carried their total up to 150 last year and the latter receded to 90. In other words, there was a gain of 24 for Great Britain, and a fall of no less that 43 from abroad. But this drop is almost accounted for by the lower number of applications (during the period represented by the specifications) for protection for so-called "inventions" in connection with lighting—principally incandescent—many of which are absolutely worthless so far as they have served, or will ever serve, any useful purpose. The 75 specifications in 1901 of imported inventions in lighting fell last year to 38, which, curiously, was the number represented by British inventions in this line in 1901. For the latter the figure last year was 32; so that in respect of lighting inventions of all kind, Great Britain has had a relapse of 6, as against 37 in respect of inventions from over the sea. The total figures must be regarded as very satisfactory, and generally may be taken as indicating a larger activity among the inventive geniuses of the home gas industry, whose names include those of several well-known men.

Now when we come to make an analysis of the 240 specifications dealt with last year, we find further ground for congratulation and pleasure; but the enjoyment may only be transient, as we recognize that we have abroad friendly rivals who may soon turn the tables again. We should like to see the development of a studied emulation in this matter of invention and discovery in the industrial world in which our readers move, and over which we have to keep a diligent watch. But that by the way.

Taking up first gas construction work and manufacturing apparatus, in order to see where we excel and the lines to which inventors have chiefly applied themselves, we find a good range of subjects have been dealt with. Noticeable attention, in comparison with previous years, has been paid to retort-settings and their fittings. Five specifications from home sources dealing with retort settings and furnaces were noticed; but we had not the pleasure of dealing with more than one—and that describing improvement in inclined retorts—from abroad. But, connected

with the latter type of retorts, there were proposals from this country in connection with the fittings. There was one (the authorship of which will be readily recognized) for manipulating the slide-valves of coal-measuring chambers; two in connection with stoppers and lids; and a fresh idea for measuring, conveying, and charging coal into inclines. In quantity, this is not much improvement for inclines; and as to quality, there may be renewed indignation in Copenhagen over this mention of the attack made by the first idea on the beautiful simplicity and automatic operation of the inclined system. Still in connection with retort-settings, one home inventor has been courting the thanks of gas managers by a new method for clearing ascension-pipes; while another has given us an additional retort-lid fastener. *Per contra*, we have a gentleman from abroad showing how leakage through the walls of retorts, coke-ovens, &c., may be prevented; and another has communicated some improvements in mouthpieces. But there is an excellent show of ingenuity and novelty in connection with retort charging and drawing machinery; and some engineers of note are found in this field. Altogether there are six specifications in this class; and the honours are even between English and foreign origin.

Before leaving the production of gas and turning attention to other sections of plant, it may be noted that improvements in water-gas apparatus or accessories are not by any means striking in point of numbers. There are only two home suggestions (including Messrs. Tully and Lewes's system of producing "gas suitable for heating and illuminating purposes") and two from abroad. Various systems of manufacturing gas continue to have a charm; and we find four claims for protection from home sources and eight from abroad in this category. Of the same lineage, "producers" of gas for motive power and other purposes in the twelve months totalled to six; and these are all of British origin.

Awakened interest has been evinced of late in purification plant both by manufacturers and inventors; and the palm for making the greater number of claims in this regard must also be accorded to this country. No less than sixteen specifications were noticed in this line, only three of which came across the sea. This is a good record; and it shows that the purification box, the fittings, and indeed for the matter of that the system itself, have not become stereotyped, and brains are still busily exercised over them. To the credit of this country stands a proposal in condensation, and one in washing and scrubbing; while there is one from abroad connected with the extraction of tar. From afar, too, comes a method of treating spent substances in the purification of gas. The building and working of gas-holders are (it is to be hoped) benefited by three improvements of English birth; but there is not a representation this year in this particular direction from abroad. We are a little perplexed as to whether or not to claim for this country the whole of the fresh ideas in coke-conveyors. There are four separate claimants for protection in this sphere of promise—and difficulty; and one of them is Mr. F. D. Marshall, of Copenhagen. However, we can afford to be generous; and so will allot his improvement to our Continental friends. Akin to conveyors is an imported coke-quenching arrangement. Equal is the honour in four suggestions for increasing the serviceableness of valves. A support for pipes and a method of constructing chimneys are both natives; but a foreign inventor of great economical keenness has disclosed a method of collecting gas generated by coal in store.

This is not at all a bad showing for a twelve months' record in improvement in gas plant and construction; and hopefully we turn to the residuals department. Of nine specifications, seven fall to Britishers. In the higher recovery group, we have a plan of treating spent gases resulting from the manufacture of sulphate of ammonia for the recovery of cyanogen; the treatment of furnace or producer gas for the recovery of ammonia and tar; the treatment of coal gas for the manufacture of sulphocyanides; and the separation of sulphuretted hydrogen from gaseous and other fluids. These are all of home creation; as are also a proposal connected with the distillation of tar, pitch, &c., a plan of raising and forcing liquids in ammonia stills, and a method of treating ammoniacal liquor. Opposed to these, we have an inventor abroad also working in the last-named direction; another offers a saturator for the manufacture of sulphate of ammonia; while a third ought also to be included for his suggestions in regard to the construction of tanks for liquids. Whether there is much here that will be of appreciable value to the gas maker, we are not in a position to determine without an inquiry of a character that cannot be contemplated for want of time and opportunity; but the indication afforded by the specifications of the pursual in this country of increased knowledge in the higher branches of recovery from waste products is certainly welcome.

Leaving manufacture for distribution, we are at once confronted by something that is to us altogether inexplicable. It is as to why there is so little interest taken abroad in the improvement of the prepayment meter. It would be interesting to have some authentic information on this point. For the betterment of ordinary meters, there are three home projects, and four foreign; and one inventor abroad has produced a meter specially adapted for high-pressure gas. But in the development of the prepayment meter, we have thirteen British claims for protection of rights, as compared with only one from abroad. There was practically the same proportion for 1901—twelve to one. We should like to be enlightened as to the reason for this apparent hesitation of meter makers and gas engineers abroad in turning their hands and brains to the raising of the efficiency of the coin meter. The success of the prepayment meter system in these isles has also brought a few home-produced accessories—for example, a meter padlock, an alarm device for warning prepayment consumers of the exhaustion of the supply for which they have paid, a coin-counting device, and contrivances for facilitating the collection of coins.

There, again, pre-eminence is distinctly ours; and with interest we turn to the appliances for the utilization of gas. First in order comes incandescent gas lighting; and if the twelve months' specifications can be relied upon as a sign, they assure us of an extended interest in this country in the matter of improvement, which we are inclined to attribute to the greater freedom that now exists here in this particular sphere. In it we were beaten hollow by the importations of 1901; but the past year's register has completely changed the position. Thirteen burners (including one or two anti-vibrating devices) are entered to our credit; while eight is the total introduced from foreign sources. Lanterns and lamps of various kinds—principally for incandescent purposes, and some for securing increased luminosity—are represented by seven British proposals, and by five from abroad. There is also one method, emanating from Woolwich, for obtaining high-pressure gas. Examining the various specifications attentively, it seems clear that the trend of investigation and improvement is towards securing greater efficiency as regards luminosity from within the lamps themselves, rather than from the use of external auxiliary means. In mantle improvement, we can only oppose four inventions against nine; but in the burning off and seasoning of mantles, there are two good proposals to be set against one from abroad. An English inventor has also been giving attention to the supporting of mantles. Atmospheric and lighting burners are represented by ten improvements, six of which are from abroad, and a suggestion for the better mixing of gas is also an introduction. Of three gas regulating governors, we can claim two. Igniting and extinguishing devices, and arrangements for raising and lowering flames at predetermined times, are favourite subjects for our Continental friends; and to them we give credit for nine proposals compared with two. A contrivance for automatically turning on and off gas or water is a native idea.

Great activity is shown in the gas-engine field; the sum of the inventions being 23, of which 16 are home produced. A combined gas generating plant and engine is also of British origin, as is a method for testing the quality of gas used in engines. Two gas carburettors for motive and other purposes are ours; and so is a method of utilizing gas for industrial purposes. In this section of the year's record, Great Britain is again strong. In heating and cooking, the account of development is weak; and patentable invention in this direction appears to be having a long pause. Five heating appliances received notice (one being from abroad); and two cooking-ovens, both of English birth. Brackets and fittings are another neglected line; only one idea from abroad saving representation. In miscellaneous directions, there is a gas-heated water-boiler, a method for regulating the flow of gas through pipes, an adjustable gas-tap, a gas-escape indicator, and a gas-main stopper—all British contributed; while, on the other hand, a method of controlling the gas supply to bath-heaters, and one for heating solid materials with gas are of foreign origin. We are afraid there is very little money in the acetylene field; for the paucity of inventions, compared with the excited rush of a few years since, shows that inventors have become somewhat disgusted with the predicted opportunities. The prophets have been dishonoured; and the result is reflected by the fact that, of the year's specifications, only four were found worthy of brief notice—two from abroad, and two home suggestions. The former consist of a system of gas lighting by acetylene, and a method of treating and purifying acetylene; and the latter comprise an acetylene burner, and a method of treating carbide of calcium.

This completes the review of the year's specifications; and we must say that we leave the task with a greater feeling of satisfaction than twelve months ago. As already said, there is a marked improvement in worth; and, in point of number and variety (this we regard as secondary in place, excepting in respect of the indication it affords of activity), British invention in gas apparatus and appliances, as far as our own Patent Office records disclose progress, stands well ahead.

"Hazell's Annual for 1903."—We have received a copy of this useful "Annual," the publication of which has been delayed for about a month to allow of a record of the events of the whole of the past year being included. Consequently we find a succinct, but complete, account of the legislative work which resulted in the passing of the Metropolis Water and Elementary Education Acts. All the permanent features of the work have been thoroughly revised and re-written, so as to make it, in effect, a new book, apart from the large quantity of additional matter. Reference to the various subjects dealt with is facilitated by the alphabetical arrangement of the contents, to which, moreover, a key is furnished; and besides this there is a list of new articles. The summary of the debates and legislation of the session is a specially valuable portion of the book. With the assistance of Mr. W. Palmer, B.A., as Editor, and an able staff of contributors, Messrs. Hazell, Watson, and Viney have made the issue of their "Annual" an indispensable book to professional and business men.

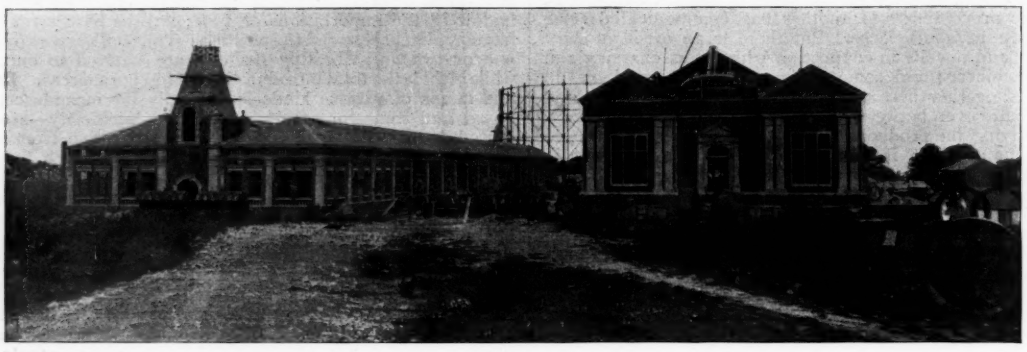
THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

DESCRIPTION PREPARED

BY

WALTER RALPH HERRING, M.INST.C.E., *Engineer.* *

ARTICLE IV., accompanied by Plate No. 5 which shows the Buildings for the Coal-Store and Plant and Boiler Houses, together with Sections for the Foundations of same.



PHOTOGRAPH No. 18.—Giving a general view of the south end of the retort-house and coal-store block. (Aug. 28, 1901)

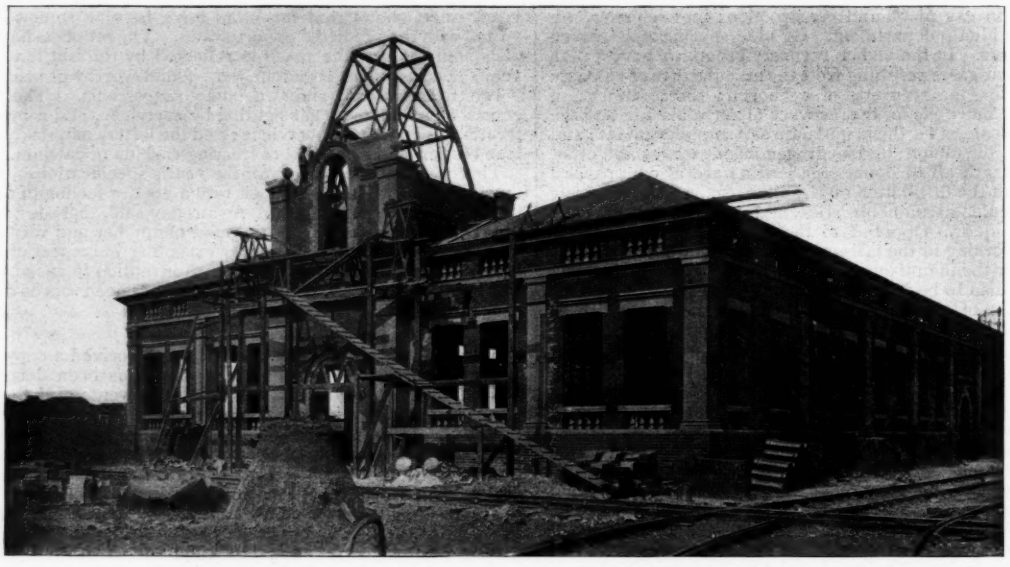
The block of buildings for the coal store, measuring 500 feet long by 93 ft. 3 in. wide (as will be seen from Photograph No. 18), is immediately parallel with the retort house block—there being a space between the two buildings of 69 ft. 9 in.

At the south end (as shown on Photograph No. 19) provision is made for the reception of the ammonia and cyanide plants, &c., by dividing off a portion of this building 92 ft. 6 in. long inside by the full breadth of 93 ft. 3 in.

At the north or opposite end (Photograph No. 20) a portion, 113 ft. 3 in. by 93 ft. 3 in., is divided off for the reception of the steam-generating plant and also the briquette manufacturing plant.

Practically the same principle has been followed in the construction of the coal-store buildings as was the case with the retort-house block—namely a series of masonry piers with a panel work filling in between. At the base and for a distance of 5 feet up (Photographs Nos. 21 and 22), the brickwork is 18½ inches thick, stiffened by means of pilasters at 24 feet centres. Above the plinth-line, the work is 14 inches thick, stiffened by internal and external pilasters to a total height of 19 ft. 7 in. where it is increased to 18½-inch work, forming a frieze course and cornice—the general design being such as to tone with the design of the retort-house block. The method of constructing the foundations for these buildings has already been dealt with in previous articles.

The longitudinal sections shown on Plate No. 5 illustrate the original ground-line and the varying depths to which the piers had to be sunk to secure a stable foundation for the structure. At the plant-house end, the floor-level is sunk 6 feet below the general yard-level, and openings were provided in the walls for the passage of the main pipes therethrough. The object of sinking this basement was to permit of the mains entering and leaving the building without any unnecessary introduction of bends and branches; the connections to the whole of the plant lying upon the floor-line, with suitable gangways erected above them for giving access to all parts of the plant where necessary.



PHOTOGRAPH No. 19.—Showing the south end of the coal-store block, forming the plant-house. (May 16, 1901.)

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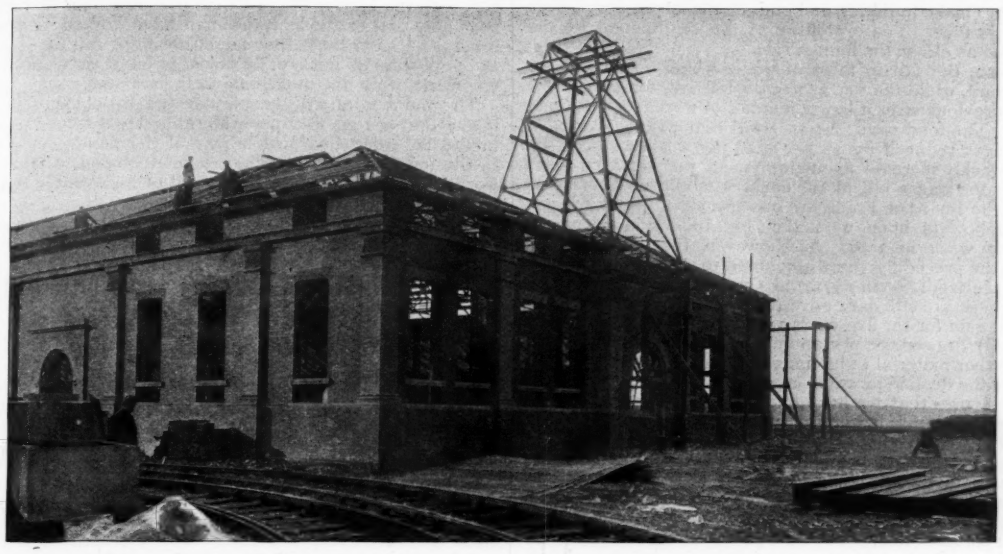


PHOTOGRAPH No. 20.—Showing the north end of the coal-store block comprising the boiler-house, &c. (Feb. 15, 1901.)

PHOTOGRAPH No 21.—Shows the first course of brickwork upon the brick-encased concrete foundations, with the damp-proof course at the yard-level. (Oct. 31, 1899.)

PHOTOGRAPH No. 22.—Illustrates the construction of the coal-store above the plinth-level, showing the formation of the pilasters, &c. (July 31, 1900.)

LABOUR MARKET IN 1902.

THE preliminary statistics published by the Board of Trade relating to the changes in rates of wages and hours of labour, and to the number and duration of the trade disputes during last year, afford material for a survey of the state of the labour market in 1902. An examination of the various tables shows, as was expected, that the circumstances of the working classes changed for the worse rather than for the better during the past year both in regard to the volume of work required to be done and the rates of wages paid. But this change was, to a large extent, only a continuance of the rebound from the very prosperous circumstances which prevailed in the period of great industrial activity that ended with 1900, and does not indicate any real set-back in the normal condition of the working classes. As a matter of fact, the general conditions under which labour is employed have steadily improved the last twenty years, however much temporary ups and downs may, at one time, accentuate, or, at another, obscure the truth.

The "employment chart" for the year shows that the percentage of unemployed members of the 224 Trade Unions making monthly returns to the Board of Trade was higher throughout 1902 than it was in 1901, and was higher during the last six months of the year than the mean percentage for that period during the ten years 1892-1901. The year began with 4·6 per cent. unemployed, compared with 4 per cent. at the beginning of 1901, and a mean of 5·3 per cent. for the previous ten years. It ended with 5·5 per cent. unemployed, compared with 4·6 per cent. at the end of 1901, and a mean of 5·3 per cent. for ten years. Shipbuilding shows the most serious decline; while the iron and steel industries, both raw material and finished, were slacker at the end than at the beginning of the year. The building trades were inclined to be dull throughout the twelve months, and the leather trades slackened considerably. The coal and cotton industries, on the other hand, have had a good volume of employment, although the cotton trade has had on the whole a very unprofitable year. Dock and riverside labourers in London have found a steadily increasing difficulty in obtaining employment during the year—a fact which largely accounts for the revival of the "unemployed" agitation recently. During the last four weeks of the year, the number of labourers employed daily at the docks and principal wharves averaged only 14,693, compared with 15,080 in the preceding five weeks, with 16,322 in the corresponding period of 1901, and with 16,352, the average for December in the five years 1897-1901.

With 1500 or 1600 more casual dock labourers on the unemployed list day after day, through a reduction in the amount of work to be done, and with a certain number—not a large, and happily a decreasing, number—of discharged soldiers unable to find a job (and the fact must not be overlaid by sentiment that there is a proportion of thorough "wasters" among these "time-expireds," as well as among any other large body of men), it is not difficult to construct a fairly imposing procession to march through the streets of London, and draw coppers from a populace more generous than thoughtful. By this we mean, not that we have no sympathy with the man who would work if he could, and who with his family is feeling the pinch of undeserved want, but that the public have no guarantee that the individuals composing these miserable processions have ever done, or ever will do, an honest day's work in their lives. So that it is an act of folly to put into the collecting boxes money which could be spent to much better purpose by properly organized relief institutions whose

administrators make inquiries, and enforce the labour test, before granting assistance. The exploiting of the sentimental by the idle is a game as old as the human race.

During 1902, the fall in rates of wages which began in 1901 continued; and, while the net aggregate fall was somewhat less than in the previous year, a larger number of workmen sustained a decrease. The total result for 1902 was that 785,000 workmen had their wages reduced by 2s. per head per week, while 90,000 received a weekly increase averaging 1s. 2d. per head, or a net reduction in the wages bill of the country (so far as alterations reported to the Board of Trade are concerned) of about £72,000 per week, following upon a similar net reduction of nearly £77,000 per week in 1901. As, however, the net increases obtained in the preceding years amounted to £381,000 per week (£81,000 in 1898, £91,000 in 1899, and £209,000 in 1900), it will be seen that wages are still far above the level of five or six years ago; the net gain for the five years 1898-1902 being £232,000 per week, or (say) £12,000,000 per annum. There is, therefore, still room for further material reductions; and no doubt the present year will see the decline in wages continue.

The large figures that we have quoted would convey a quite erroneous impression, if it were not pointed out that they do not represent changes affecting equally the general body of workmen in this country; the fact being that the bulk of the increases and decreases in wages reported during the past five years affected the coal miners only. These men received enormous increases to their wages in the three years ending 1900, and have had to suffer considerable, but by no means in all cases equivalent, decreases since. In fact, last year the decrease in coal miners' wages amounted to £74,000 per week, or £2000 more than the net aggregate fall; so that, apart from the colliers, the workpeople's wage bill rose slightly, the only other group showing a decrease being that including the engineering and shipbuilding trades, in which about 29,000 men (employed in shipyards on the North-East coast and at Barrow) sustained a decrease of 1s. 6d. per head in their weekly wages. The building trades group again shows an increase in wages; 15,490 men receiving an advance averaging 1s. 2d. per week. This follows upon a steady rise in wages for a long period of years; net increases of considerable amounts having been recorded during every year since 1893. These higher wages, combined as they have been with a smaller output of work per day per man, go to swell the cost not only of erecting business premises, public buildings, and the houses of the wealthy, but of building dwellings for the working and poorest classes; thus rendering the great housing problem less easy of solution than before.

Turning to the question of labour disputes in 1902, we find that the number of disputes begun, and the number of working days lost, during the year was lower than in 1901, though the number of hands thrown idle by disputes was considerably greater; so that the stoppages of work were on the average of much shorter duration. The total number of working days lost (3,478,000) was the third lowest for the past seven years; the highest figures being 15,290,000 days in 1898—following upon 10,346,000 days lost in 1897—while the best year was 1899, when "only" 2,516,000 days were wasted. In 1901, the time lost amounted to 4,142,000 days (an increase of a million days over 1900), with an average of 23 days lost per men engaged in the disputes; and it looked as if the wastage of time in labour troubles was on the rise again. Last year, however, as we have said, showed a decline both in the number of stoppages (from 642 to 427), and in the average duration of each stoppage (from 23 days to 14). We attribute this welcome check in the revival of strikes, not to any access of reasonableness to Trade Union officials and members, but to the wholesome deterrent effect of the several decisions of the Law Courts that have, during the past year or two, demonstrated to an indignant and surprised body of men that they are under the same legal obligations to respect the freedom and rights of their employers and fellow-workmen as all citizens are to respect the liberties of their fellows, and that any failure to fulfil those obligations carries with it risk of disagreeable consequences.

When these inconvenient, if somewhat obvious, principles of common law have been forcibly impressed upon the officials and members of the great coal miners' organizations, we may hope for a still further diminution in the senseless and costly waste of time brought about by labour disputes; for it is a matter of common knowledge that far more time is lost in the coal mining industry through strikes than in all the other trades in the kingdom put together. Last year was a notable instance of this fact. Out of a total of 3,478,000 working days lost in labour disputes, no less than 2,396,000 days, or nearly 70 per cent., were lost in consequence of strikes in the coalfields. These included the strike of pit lads in the Federated districts, the prolonged and futile struggle at Denaby, and two stoppages of a considerable number of men for a short while in South Wales. Outside the coalfields, the only strikes of note were those of 4000 enginemen and tinplate workers at Llanelly, 1600 ship joiners on the north-east coast, and 1600 locksmiths at Willenhall. One of the latest reported strikes in the year was one of 520 shipwrights and others at Middlesbrough, which began on the 3rd of December, and still continues. The "alleged cause or object" is stated as "on account of firm's decision to place the works on three-quarter time." Considering the present state of employment and business in the shipbuilding trade, one would have thought the men would have been glad to have "three-quarter time" employment; but, with the known Trade Union preference for no bread rather than only part of the loaf, the men have worked "no time" for several weeks because they might not work full time! Probably the employers do not greatly object to let their works rest for a few weeks while the men come to their senses.

The number of workpeople affected by changes in hours of labour during 1902 was inconsiderable, apart from the reduction in the Saturday hours of labour of the hands engaged in the textile industry. If this change be included, about a million workers were affected to the extent of an average reduction in working time of about one hour per week.

A PROGRESSIVE LIBRARY, AND THE PROMISED PHOTOMETRY COMMISSION.

THE Société Technique de l'Industrie du Gaz en France has been looking into its financial condition, and is in the happy position of being able to report to the members that it is sufficiently good to permit of further purchases being made of new books of interest to the gas profession. A special register is, therefore, to be kept at the offices in Paris for the purpose of recording the titles of technical works which the members think should be added to their already creditable library. We can heartily congratulate our French colleagues on this very satisfactory position; and compliment them on the form in which their progress is signified, as it indicates that the historic literary spirit of France is none the less active among the members of the gas profession there than it is in other walks of life. We confess, however, to having some little feeling of jealousy in this matter; and we cannot help longing that this good fortune and this pleasing progress were that of the English gas profession as well, or that they had some share of it. There is now a new Institution of Gas Engineers; and, it is to be supposed, a technical library made up of the combination of those of the bygone Institute and Institution. What is going to be done with it? What use is it going to be? What service is it going to render to the members who own it, or to the gas profession as a whole? Is it going to stand idle, unsought, neglected, dusty, and undeveloped; or is it going to be used, fruitful, cared for, and extended? We sincerely trust that it will be the latter.

The Articles of Association of the new Institution give the power "to establish, form, and maintain a library and collection of models, designs, drawings, plans, and other articles of interest in connection with the manufacture and application of gas." Further power is also given "to print and publish, sell, lend, and distribute any communications made to the Institution . . . and to purchase, reproduce, print, publish, and distribute any other books, papers, treatises, or communications relating to gas engineering," &c. What is going to be done with this power? Anything or nothing? Is it going to be a dead-letter or a live spirit? Other references in the Articles of Association concern "the management and use of the library and other buildings or rooms of the Institution," and the Secretary, who is "to have charge of the library." We certainly do not see why a proper Honorary Librarian should not be appointed; and, further, why some system for the loan of books to members should not be established. The subscription to the Institution is only one guinea; and there are, we believe, many who would willingly pay a little more as a regular contribution to a library fund, provided something really useful were done with it. There are many excellent leaflets, for example, on current topics of interest to the gas manager, that he might be only too pleased to have in his possession, to enable him to fortify his position and the commodity he sells. Why should not such leaflets—on electric light competition, heating and cooking by gas, and a hundred other items—be sent round from the library headquarters as occasion called for, as is done by many political organizations as subjects of vital interest to their subscribers and partisans? It seems to us that gas propaganda might thus be organized and spread abroad, the industry strengthened, and its utility increased. The loan of books would undoubtedly prove of inestimable benefit to many a student or manager far removed from any centre of intellectual activity or of technical research. Then, again, the library should be thoroughly cosmopolitan, reflecting the theories and practices of different technicians in different countries. Lastly, we know of few things more calculated to increase the esteem of fellow-members in any institution, or to raise the prestige of any scientific body in the eyes of the general public, than the fact of having a thoroughly well-equipped and well-used library. May the Council of the new Institution of Gas Engineers give these few thoughts full consideration!

There is one other matter connected with the Société Technique. It will be remembered that the International Gas Congress of 1900 appointed a Committee "to determine the rules to be followed in the photometrical observations of incandescent gas-burners," and the "JOURNAL" at the time duly recorded the names of the members proposed to represent the different countries. Although we gave every welcome to, and had every confidence in, this International Photometrical Committee, the

hope was expressed that "the result of their labours would not be diminished by lapse of time and extraneous causes, as is often the case with similar commissions of inquiry." We were beginning to think our worst fears were to be realized, and are, therefore, all the more pleased to learn that some commencement—though a rather tardy one, perhaps—has been made, and an outline drawn up of the work to be done.

The various theories regarding the real origin of luminosity in incandescent lighting will very naturally form the first subject of inquiry; and no doubt the literature already dealing with it will be thoroughly examined and sifted. Following this, the different existing standards of illuminating power will have to be expressed in interchangeable terms. This should prove of the greatest utility, as, notwithstanding all the comparisons that have hitherto been made, there is still considerable confusion and misapprehension as to English and German candles, the Carcel and Hefner standards, and the Vernon Harcourt 10-candle pentane lamp. All such discrepancies being swept away, the Committee will then enter upon the real business of establishing the rules to be applied to incandescent photometry. Of course, a good deal has already been written on this subject, such as Herr Dr. H. Bunte's paper on "Incandescent Gas Lighting,"* M. Lecomte's contribution on the "Photometry of Incandescent Mantles," read to the Société Technique meeting at Dieppe in July, 1901, and also the report† of the Photometry Committee of the German Association of Gas and Water Engineers, presented at their meeting in Vienna in June, 1901. It will thus be seen that a number of detailed proposals have been put forward; and it will be for the International Committee to pick and choose, investigate, and experiment for themselves.

It is proposed that the standard to be taken shall be a burner consuming 110 litres (3·885 cubic feet) per hour at a pressure of 40 mm. (1·575 in.). This, it may be called to mind, was the standard suggested by MM. Stœcklin, Rieder, et Cie., of Mulhouse, in their International Gas Congress paper. Several details in the tests are specified by the Committee as meriting particular attention, such as the duration of lighting before commencing any test, shapes of chimneys, constant consumption of burners, and the regulation for standard consumption and pressure, &c. The mantles themselves will obviously demand special treatment to ascertain the differences from different makes, the character of their constituents, and the reasons for variations in their strength, life, and illuminating power. The last point formed the subject of a paper by Dr. Emil Liebenthal, of Charlottenberg, read at Mayence in 1900.‡ Correlative to the foregoing inquiries is the very important consideration of the calorific value of the gas. To what extent, and how, does this affect the illuminating power of incandescent lighting? If the lighting and heating values of a certain gas be known, can the illuminating power of another gas be found out from knowing its heating value? In short, can lighting comparisons be made from calorific powers? These are some of the questions that the Committee will seek to answer. Finally, the possible standardization of screw-threads, which has already been broached by the French Gas Society, will be considered; but we do not see any mention of high-pressure incandescent lighting, which should surely receive some attention.

These are some of the points in the programme of the International Incandescent Photometry Committee; and their labours will be by no means light. But if they succeed, as we have every reason to hope and believe, in satisfactorily laying down proper rules and regulations to govern the measuring of modern gas lighting, they will place both the gas profession and the public at large under a great obligation to them.

* See "JOURNAL," Vol. LXXVI., p. 642 † *Ibid.*, Vol, LXXVIII., p. 1663.
‡ *Ibid.*, Vol. LXVII., p. 994.

ELECTRIC LIGHTING MEMORANDA.

The Electricity Undertaking of the Shoreditch Corporation—After Four Years—Underselling at the Expense of the Rates.

THE Shoreditch Corporation electricity supply undertaking is a concern with "a past;" and the expression does not differ in purport from the same words when used in respect to characters in the modern drama, inasmuch as the meaning is a bad one. Originally the Shoreditch undertaking was designed to subserve a variety of interesting purposes besides affording light to the inhabitants of the borough. Most of these have been dropped, one by one; and now it merely does such lighting as can be picked up, and runs more or less uncomfortably in double harness with a dust destructor. Lest we should be accused of regarding this performance with a prejudiced eye, we will base this notice of the Shoreditch undertaking wholly on the accounts appearing in the "Electrical Times," with the accompanying observations. It appears that the undertaking has completed its fourth year; and although the official accounts are made up to last Lady Day, they have only just been published. There is some reason for this shyness of the Shoreditch borough authorities, in the slowness of the speculation to justify the sanguine expectations of its founders. In four years a municipal electricity supply undertaking may very reasonably be supposed to attain its commercial majority, more especially in a mercantile London district. If the public do not appreciate the service in that time, it is more than likely that they never will.

After four years, the Shoreditch concern stands the ratepayers in a capital cost of £260,549, and brings in a revenue from electricity supply of £33,281. It cost to run £25,952, according to the revenue account. We state, advisedly, that this is the figure given in the accounts; but whether it is a correct one or not is a question. The amount charged to rent, rates, and taxes on this considerable industrial property is the lavish sum of £635 for the year, which works out to 0·06d. per unit. Management expenses, including all salaries in the Engineer's department, collectors, accountants, clerical staff, stationery, printing, law charges, insurance, and general establishment charges, amount to the trifle of £2106, which works out to 0·18d. per unit. So marvellously frugal is municipal administration! The reward of this husbandry is a "gross profit" on the year's working of £8034, out of which interest on loans and sinking fund takes £7418, leaving the magnificent trading "profit" of £616 to bless the ratepayers withal and vindicate the wisdom of the Council in going into this remunerative business. It is almost needless to remark that there is not a penny charged for depreciation or any similar object. Yet this is, in its way, a successful undertaking. That is to say, it appears to meet a real want in the way of a considerable local demand for electricity, especially for power—probably proceeding from the peculiar local industry, which is cabinet-making and what the French comprehensively term "beddery." Having regard to the inflammable nature of the materials used in this trade, electric light and power would strike one as exactly fitting the case. It might be expected that there should be in consequence fewer of those great "Curtain Road Fires," which used to signalize the district in the annals of the Metropolitan Fire Brigade. Indeed, the load-factor of the central station is exceptionally good at 21·29 per cent.—a figure that is rarely improved upon anywhere. Consequently it is the fact that the installation has found better employment than most.

On the other hand, experience shows here also that while a power connection may be a desirable branch to cultivate, it has to be done, if at all, at a very low rate. The Shoreditch Corporation compete with The Gaslight and Coke Company. who are among their largest ratepayers, by offering electricity for power and heating purposes at 2d. to 1½d. per unit. Even on their own showing, the works' cost for current is 2·04d. per unit. It would be sheer waste of words to argue that this is not fair dealing. It is Municipal Trading; and that must suffice to classify it. What with this excessive generosity (at other people's expense) to the power user, the Corporation only obtained an average price of 3·07d. per unit from private customers, and 2½d. per unit for the public lighting. On these terms, there is small wonder that the demand still continues to grow at a rapid rate. Where a tradesman is content to sell his wares continually at an "alarming sacrifice," he can usually reckon upon a big turnover. But what is the end of these things? That is a secret for those who have to bear the loss after all. We notice that our electrical contemporary concludes clearly that "the undertaking is not particularly benefited by its connection with the refuse destructor." That is a domestic matter. What we are more particularly interested in is the ascertained and proved truth that this much-advertised municipal undertaking, with the high load-factor which attests its substantial industrial success, can only achieve the latter showing by underselling at the cost of the rates. After four years of desperate endeavour, a beggarly margin of paper profit can only be shown by systematically doctoring the revenue account in the sense of keeping out the full and proper charges for carrying on the business. Where is the next industrial concern established at a cost of upwards of a quarter of a million sterling rated like this? At Stepney, next door, where the spectre of insolvency is dodged in the same fashion. The usual burden of rates on the Metropolitan Electric Lighting Companies is about 0·30d. to 0·40d. per unit—upwards of five times the money. If the Shoreditch property were rated as is the Kensington Company, which is not a much bigger concern, the Corporation would be paying, not £635 a year on this head, but sevenfold the figure, or £4445 a year. Again, if they charged as honestly for administration as, say, the Hampstead authority do, it would cost them nearer £5500 a year than the £2106 they have the effrontery to enter up. Therefore, unless these other entries are altogether to be distrusted—which, seeing that they are about the normal, cannot be urged—the Shoreditch Corporation lie under reasonable suspicion of having cooked their revenue account to the tune of about £7000 a year or thereabouts. This imputation is perhaps not the most that could be made out of these amazing accounts; but it will do to go on with. Possibly the actuarial gentleman who criticizes municipal finance in "The Times" will spare a little attention for this very interesting example, supplied, so to speak, on the spot, of some of the evils, the existence of which can only be ascertained by those who will take the trouble to go into the subject thoroughly. Gas companies do not object to fair rivalry, even by the local authorities which they help to support without having the power to influence by a single vote. But this Shoreditch mixture of municipal trading at cut-throat prices and illusory book-keeping is rather too strong to be taken patiently.

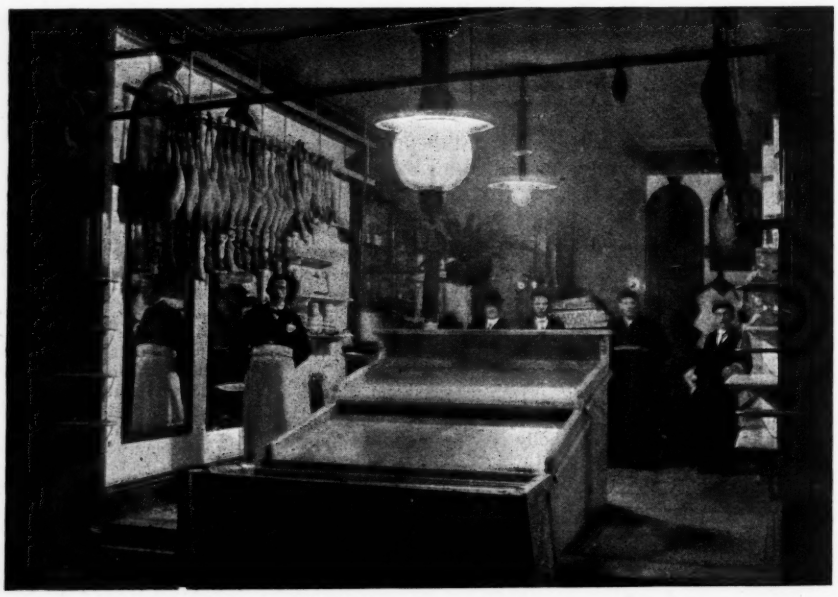
PHOTOGRAPHIC RECORDS OF WORK, AND PICTURES BY GAS LIGHT.

THE camera has found its way into many gas-works; and the engineers and their assistants are daily setting more and more store by the faithful records obtained by its use of the progress and features of new constructional work, from which few thriving undertakings are free for any length of time. This system of pictorially recording work is one to be commended; and when once tried has never, so far as our knowledge goes, been rejected. The pictures obtained are of perennial interest and of historical value. We may instance the photographs illustrating the series of articles on the Granton works, and those which added to the attractiveness of the two articles on the new works at Milan in our last two issues. Moreover, apart from the interest in preserving such a record, the camera—in the hands of a careful operator—cannot lie, nor is it subjected to other frailties of human nature. 'Tis human to err; and the memory cannot always at an after date be focussed with preciseness on to the condition of a piece of plant, or the point to which work had progressed, on any particular day. The photograph is not weighted with the many claims that are made on the memory; and the image that is transmitted by the lense to the plate in the camera, and is subsequently developed into a picture, is far more faithful in its presentment than can possibly be verbal evidence founded on the memory, or rough and perhaps incompletely made notes. We hope to see a large growth of the practice of photographically recording building and engineering operations in gas-works, and to find the well-fitted dark-rooms that have of late years been seen at certain gas-works become a general institution.

NIGHT PHOTOGRAPH OF INSIDE ILLUMINATION BY LUCAS LAMPS AT MESSRS. BARBER & CO'S., BLACKFRIARS.

However, the personal interest and skill of gas engineers and their assistants in photography is by no means limited. To many, we have excellent reason for knowing, the cultivation of the art in connection with their professional work is a very real pleasure. But the pleasure is not confined to the practical application of the art within the area of their works—the interest so engendered gradually extends to its wider progress and application without. And so we venture to refer to one or two matters which touch them in a double way. The usefulness and scope of photography were considerably increased during the latter years of the old century by the spread of electric lighting; and it was a matter of considerable interest to the gas fraternity when it was found that the incandescent gas-light was capable of highly successful application in the same field, and promised to be a powerful rival, both in efficiency and cost, to electricity for this special purpose. In portraiture by the incandescent gas-light, we have seen some fine work which could not be surpassed, we undertake to say, by work executed by the aid of the electric light. Of interior pictures, taken by no aid other than the fixed incandescent gas-lights, some good examples have been shown in the "JOURNAL;" and now by the courtesy of Mr. C. C. Borup, who is a professional photographer of Herne Hill, and Moffat's Limited, who own the British patent rights in the well-known Lucas lamp, we are able to illustrate some effects of street photography at night time, in which gas alone is the illuminant. At the time of the Coronation illuminations, we published one or two examples; but that was lighting on an extraordinary scale, and not, as in the present instances, on a scale which, in these days of high-power requirement, is becoming to be regarded as nothing unusual.

In these pictures, as in the subject of photography by gas-light generally, gas engineers who are photographers have, of course, a dual interest; and they will find a little information on this subject of outdoor photography entertaining. In all forms of photography, the exercise of great care and discretion is, of course, necessary on the part of the operator for the realization of good results; but in none more so than in this—the personal element indeed enters largely into the success or otherwise of the views. The photographs from which the pictures have been prepared were taken by an ordinary camera, with a first-class landscape lense; and this Mr. Borup has found well suited to the work to which he has been devoting considerable study. Backed, rapid plates (preferably isochromatic) are essential, in order to minimize what is technically known as "halation," and to mitigate the evil effects of extraneous light, such as would make their presence felt in most cases of night photographing with relatively long



NIGHT PHOTOGRAPH OF ONE OF MESSRS. SLATER'S SHOPS LIGHTED BY LUCAS LAMPS.

exposures. Of course, no rule can be given for exposure at night-time. They are as variable as in daylight, and subjected to even more disturbing influences. They may vary from a minute upwards, according to the power of the lights and the general conditions as to arrangement, environment, and perspective. In taking a photograph of a burning light, a compromise between two conflicting interests has to be effected. The illuminating body itself requires a very short, the surroundings a very long, exposure. To do the best for either would be disastrous to the resulting whole; and the actual exposure, therefore, has to be adjusted to "a happy mean." It therefore goes without saying that a correct estimate of the several factors determining the length of exposure can only be made after considerable experience. Most readers who have essayed this exterior night view work will recognize and confirm this; and few will say (we are not speaking of interior night work be it noted) that their attempts have produced such results as are illustrated here. "Faking" in method and of the plates has been resorted to; and then, as a rule, only the impossible is achieved. A favourite dodge is to make an exposure by the waning daylight, and finally give a further exposure at night, so as to include the lighted lamps. We have seen one or two fairly decent pictures taken in this way; but anyone can see perfectly well that they are spurious things, and not genuine night views. The method is too elaborate for assured success; and is beset by conditions tending to failure. This, and where time is a consideration, and special precautions have to be taken to secure the exact retention of objects between the exposures, and so enable the double exposure to be made under precisely similar circumstances, also adds to the cost and the labour.

Night Photograph of Outside Shop Illumination by Lucas Lamps in the Tottenham Court Road.

Another class of night view that has come under notice is one which really consists of all painting and little photography. It is obtained from a many times over-exposed negative, and afterwards made still more impossible by wholesale retouching, giving to the view a painfully false and unrealistic effect. This cannot be said of the night views of shops lighted by the Lucas lamp that we publish this week. The skill of the photographer in taking a night view by gas-light does not end with the measurement of the correct exposure under the particular circumstances of the time and place. Mr. Borup subsequently subjects his negatives to careful chemical treatment, in order to reduce the excessive light effect in parts, and to make the final result approach nearer to the actual optical effect. His examples must be pronounced as good.

Now of what use is this night photographic work to the gas manager? In the first place, it might be developed into an instructive form of recreation for the professional man; and, in the second place, we can see opportunities for its use in developing the gas business and high-class lighting among shopkeepers. Some good photographs, well placed, of shops illuminated by high-power incandescent burners and lamps would greatly assist bare worded and figured statements in carrying conviction home to shopkeepers as to the capabilities of gas in making their premises attractive and in assisting in the display of their goods—without, it may be added, giving some of the said goods an undesirable hue. There can be no more striking way of advertising various forms of gas-lamps than by pictorially showing them alight in actual use, nor a more convincing object-lesson. The picture will convey more information as to what the lamps are and what they will do than any amount of descriptive matter and the use of (to the layman) such strange terms as "candle power." It is an acceptable and novel way of advertising the merits of lamps to trading gas consumers. These remarks may also, with advantage, be taken note of by lamp-makers. A pictorial record of their more important installations on a good representative system of night photography cannot fail to be of value in drawing particular attention to them, and for making comparisons with other systems. But the productions must be creditable ones to be of any real service. More in the same strain could be written; but what has already been said in this final paragraph will, we think, be sufficiently suggestive for those interested to enlarge upon the idea to the benefit of the concerns or businesses of which they have charge.

MUNICIPAL DEBT, TRADING, AND RATES.

The subject of municipal debts and local rates was much discussed last week; and it is evidently the intention of those who take what may be called "moderate" views of the matter that Parliament shall meet in a very different atmosphere, so to speak, as regards the condition and scope of local government affairs from that of last year. Up to the present time, it is scarcely too much to say, the cause of Progressivism in municipal administration has enjoyed all the advantage that attaches to the side in politics which habitually assumes the initiative. The reaction now appears to be setting in, and the "Forward" party in municipal life are being put upon the defensive. Since we last wrote upon the subject, the monthly dinner and discussion of the London Chamber of Commerce has been held, under the presidency of Lord Avebury, who opened a debate on "Municipal Trading" in an able speech, in which he effectively contrasted the new fashion of Socialistic Municipalism with the classical Liberalism of Cobden and Bright, of Mill and of Fawcett. It is a curious illustration of the "whirligig of time" that nowadays men who profess to be of the succession of these thinkers, nevertheless cherish principles in regard to the functions of local self-government which are the precise contrary of those that inspired them. If there was one opinion which the old Liberals held more strongly and unitedly than others, it was that the less governments interfered with the liberty of individual enterprise the better. Government, according to this view, is at best a necessary evil. It is almost always blundering; and it is next to impossible for it to be abreast of the real needs of the time. There is a well-known eloquent passage of Spencer's "Principles of Sociology" that expresses this view, which, whether right or wrong, is perfectly clear, and was unquestionably characteristic of historic Liberalism.

Nowadays, it is only men who are denied the classification of Liberals who retain this opinion, which spokesmen of the order, like Lord Avebury, maintain to be as valid as ever it was. They object to the extension of municipal effort into the region of trading enterprise for various and sundry reasons. Primarily, the presumption is, that municipal bodies have not the special aptitude requisite for the successful conduct of manufacturing and commercial undertakings. Secondly, their membership changes too frequently for a business administration. Lord Avebury cited the example of the London County Council, which, after an existence of thirteen years, only shows 29 original members out of its 140 councillors. And the natural suggestion here is that these old members may either be too busy, or not busy enough for the good of the public. Upon the contention that municipal undertakings do sometimes prove to be profitable, Lord Avebury remarked that where there is a monopoly it is easy to show a paper profit; but with the possible exception of gas supply, he did not doubt that municipalized businesses were a heavy loss to the ratepayers and bad for the community. Lord Monkswell, speaking with regard to the London County Council, argued that it might be desirable in some cases for municipal bodies to undertake work, even when there was a chance of a loss being made. This did not apply to luxuries, but only to

monopolies affecting the necessaries of life. Perhaps his lordship was thinking of the proposed London County Council service of iron steamboats for a passenger traffic that can never pay for itself. He went on to speak up boldly of the danger of having too many municipal employees who are also electors.

By a coincidence, the same matter was being discussed simultaneously at the Junior Constitutional Club, where Sir W. T. Makins, Bart., presided over a well-attended meeting of members, to whom he spoke stringently on the proposed river steamboat service. He was followed by Lord Claud Hamilton, who laid stress upon the personal aspect of the general question. His chief point was that business men could not be expected to give their time to municipal duties when these involved attendance upon committees for the management of undertakings competing possibly with industries in which, as private traders, they were interested. As a result, the character and position of municipal representation would deteriorate, and the control of local affairs would be in danger of passing into the hands of needy professional politicians having their own ends to serve. Another danger arose from the increase in the number of municipal employees. In Birmingham, the City Council employ over 7000 men, which will be increased to 8500 when the Corporation take over the tramways. The prospect of having to reckon with a mass of voting power of this magnitude, directed by Trade Unions and other Socialistic influences, is fraught with the gravest possibilities. The notorious illustration of the dock-yard vote for members of Parliament is in point. What now applies to such constituencies as Devonport and Woolwich may conceivably be extended to every extensively municipalized borough in the country, which is not a reassuring reflection.

The criticisms of the actuarial correspondent of "The Times" on municipal indebtedness, trading, and rates, to which we gave publicity last week, have naturally aroused much comment from interested parties all over the country. One town clerk and alderman after another has striven to rebut the charge of reckless trading and imperilling of the corporations' credit; and, of course, where the ground is so extensive, and the positions so debateable, it is difficult to bring matters to an issue. Indeed, it is quite possible, and has been done in one instance, to draw precisely opposite conclusions from the same facts. The indictment was, broadly, that during the last fourteen years the outstanding loans of local authorities in England and Wales have advanced from £92,820,100 to £276,229,048; while during the same period the rates have gone up from an average of about 3s. 4d. in the pound to nearly 4s. 10d. in the pound. The grave question is, whether this double process can go on indefinitely. This is the question that is exercising the public mind, and is not answered by assertions that matters are not really critical in this or that selected local government area.

As we have always freely admitted, it is a matter of practical impossibility to establish a convincing relation between the fruits of municipal trading enterprises and the local rating. Even professional apologists for municipal trading in everything and at all hazards cannot prove their own favourite contention that where there is most trading the rates are lightest. And if one goes beneath the surface, and inquires as to the relation between the actual burden of rates and their nominal amount in the pound, confusion becomes hopelessly confounded. West Ham, for example, is heavily rated, at 9s. in the pound; while Norwich stands at 9s. 6d. Yet the comparative cost of working and living in the two localities is not necessarily indicated in these figures. There is valuation to be considered, as well as rating. The only thing that is tolerably certain about such data is that they are likely to particularly interest those who contemplate setting up large industrial establishments.

The sanest, and at the same time most hopeful, reply to the indictment, as formulated, is that furnished by Mr. Laverock, Town Clerk of Hull—a town which is well reputed for the prudent husbandry of the Corporation estate. This is, that the reason for the simultaneous increase of local debt and local rates almost everywhere is due to a largely-increased expenditure on education, hospitals, sanitation, and street and other public improvements, without reference to trading at all. Upon this, the natural inquiry is as to whether these demands upon local exchequers for capital and maintenance really represent a special and incidental call which is not likely to be continued? Mr. Laverock declares that while this recent increase of indebtedness and rating would have taken place just the same if there had been no municipal trading, in point of fact there is the important difference that the rates would have been higher, because there would have been no contributions by way of relief from trading profits. Now, this is just what neither Mr. Laverock nor anybody else can really prove.

In the first place, as we showed last week in connection with the Board of Trade returns relating to the gas undertakings of local authorities, this kind of property, which everybody admits to be the most profitable (if not the only really profitable) asset of a trading municipality, has fallen off very considerably in this respect of late years. The reason is, that although a monopoly, gas supply cannot be carried on even by a local authority without any regard for ordinary business considerations. When bad times supervene, and the working cost of carrying on the trade increases beyond expectation, it is impossible to recover the whole of the excess from the customers at the shop, by merely raising the prices. Manchester did this, it is true; but the example is not exactly repeated to the advantage of municipal trading. For whatsoever reason there may be assignable for the fact, municipal gas supply is not more than half as profitable to-day as it was 20 years ago; and it only returns a disposable profit of 1·6 per cent. on the outstanding capital, which is all accounted for by a handful of undertakings—such as that of Manchester. Mr. Laverock would be puzzled to show how far these very local profits of trading help to reduce rates throughout the country. What other profits are there?

On the other side of the question, there is this to be said: If it had not been for the hope of windfalls in aid of the rates (not usually realized), not only would a large amount of so-called remunerative municipal indebtedness have been foregone, but a great deal of unremunerative "improvement" and expenditure would also have been spared. There has been too great willingness to spend public money for "free" parks, "free" libraries, "free" swimming baths, and other municipal luxuries, which are not free at all, inasmuch as the cost comes upon the ratepayers. Time was when people who wanted these things had to testify to their willingness to procure them in the usual way. Was not the Aston Park, Birmingham, bought by a penny voluntary subscription? Mr. Laverock speaks of schools and hospitals as accounting for some of the new municipal indebtedness. Has the "pious founder and benefactor" been altogether superseded by the corporation magnate who builds these monuments to his own public spirit at the expense of the ratepayers? It is often to be remarked that of late years British local rating authorities have made too free with their resources. One can so far agree with Mr. Laverock that the question is not entirely one of municipal trading. It is really a matter of husbandry of local resources in relation to self-government; and no partial treatment of the subject will prove of the slightest benefit.

OBITUARY.

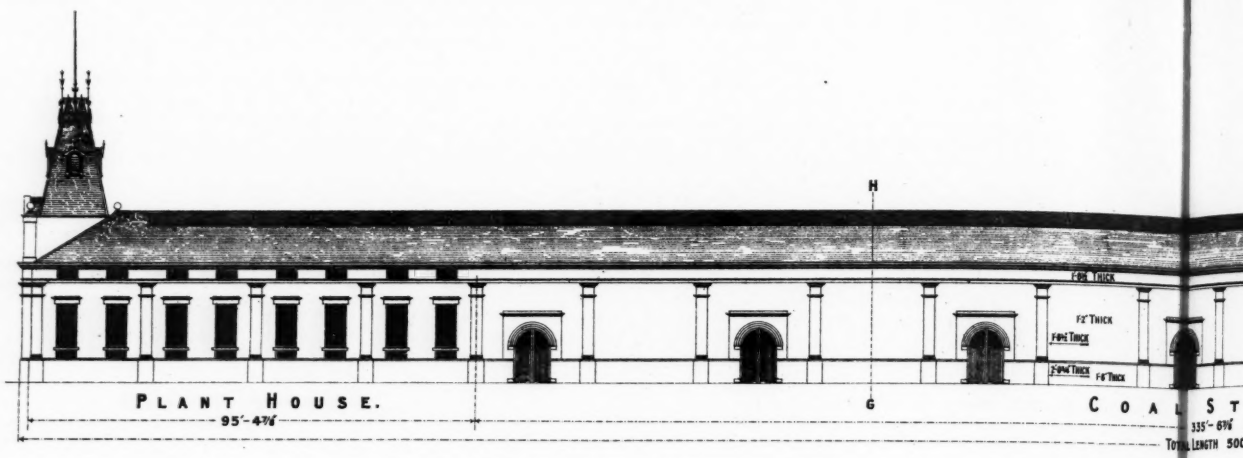
The death is announced of Mr. George Frederic King, of the firm of Bowker and King, lightermen. Deceased, who did business chiefly in coke, tar, and liquor, was well known to members of the gas profession, and was a member of the Evening Star Lodge. He was originally a tutor in the Blue Coat School. Death was due to heart failure, following an attack of influenza.

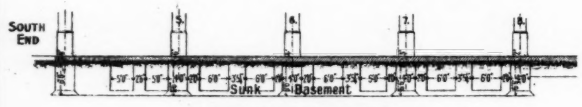
We greatly regret to record that the Polytechnic Institute, Regent Street, which has so frequently been mentioned in our columns in connection with the classes in "Gas Manufacture" successfully conducted there by Mr. Walter Grafton, F.C.S., lost its well-known Founder and President, Mr. Quintin Hogg, on the morning of Saturday, the 17th inst., under the distressing circumstances reported in another column. The deceased gentleman, who was the youngest son of the late Sir James Weir Hogg, Bart., M.P., was only 57 years of age; and he had devoted practically the whole of his life to philanthropic work, particularly in the direction of assisting youths and young men. In addition to his work at the Polytechnic, he was Chairman of the North British and Mercantile Insurance Company.

We regret to record the death on the 17th inst., in his 89th year, of Mr. Rowland Thomas, the Chairman of the Weymouth Gas Consumers' Company, with which he had been connected from its initiation. In 1866, when the gas-works were in the hands of the late Mr. Church, who leased them under Mr. Burdon, Mr. Thomas succeeded, with other townsmen, and with the assistance of the then notorious Mr. George Flintoff, in forming the Company. A meeting of shareholders was held on the 15th of February in that year; and the next day Mr. Thomas was elected one of the Directors. On the incorporation of the Company in June, 1867, he was appointed Managing-Director until the election of Directors took place under the provisions of the Company's Special Act, when the late Sir (then Mr.) Henry Edwards was chosen as Chairman and Mr. Thomas as Vice-Chairman. Sir Henry resigned in 1890, and was succeeded by Mr. Thomas, who held the office till his death. He presided at the half-yearly meeting in August last, and attended all the meetings of the Board with the exception of the one held in December. The deceased was in every sense a public man. He was returned to the Town Council in 1861, was one of the Aldermen from 1876 till 1895, and Mayor in 1884 and again ten years later. He was for many years on the Board of Guardians, of which body he was Vice-Chairman until the passing of the Local Government Act in 1894, when he was placed on the Commission of Peace. Throughout his public career, he was fearless and outspoken, and when he took up a matter which he believed would be for the benefit of his fellow townsmen, he held most tenaciously to his opinions. The funeral took place last Friday, and was attended by the Mayor, Town Clerk, a number of Magistrates, and by several Directors and officials of the Gas Company. Mr. James Lowe, the Manager and Secretary, was, however, unfortunately unable to be present, owing to an attack of bronchitis, which confined him to his house.

Midland Association of Gas Managers.—We learn from the Hon. Secretary of the Association (Mr. A. Cooke, of Oldbury) that the annual general meeting will be held at the Grand Hotel, Birmingham, on Thursday, the 26th prox.

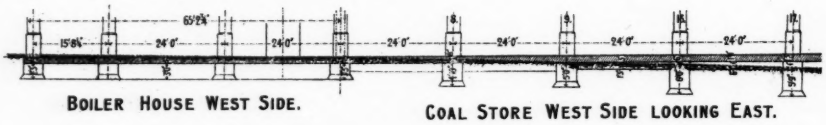
The Granton Works of the Edinburgh





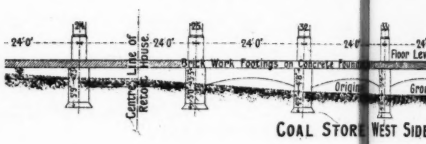
PLANT HOUSE EAST SIDE.

COAL STORE EAST SIDE LOOKING WEST.



BOILER HOUSE WEST SIDE.

COAL STORE WEST SIDE LOOKING EAST.



COAL STORE WEST SIDE

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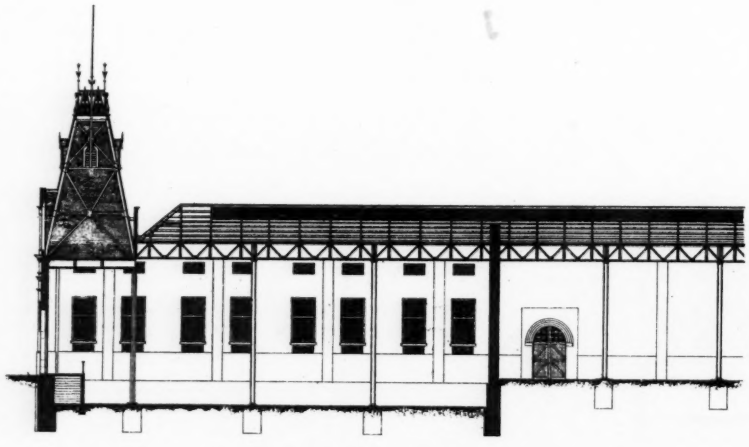
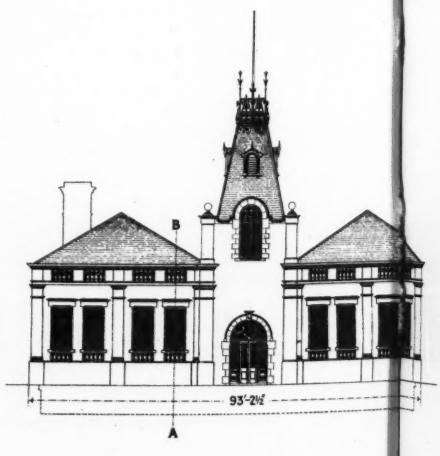
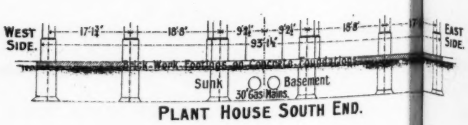


LONGITUDINAL SECTION OF PLANT HOUSE.



(SOUTH) FRONT ELEVATION OF PLANT HOUSE.

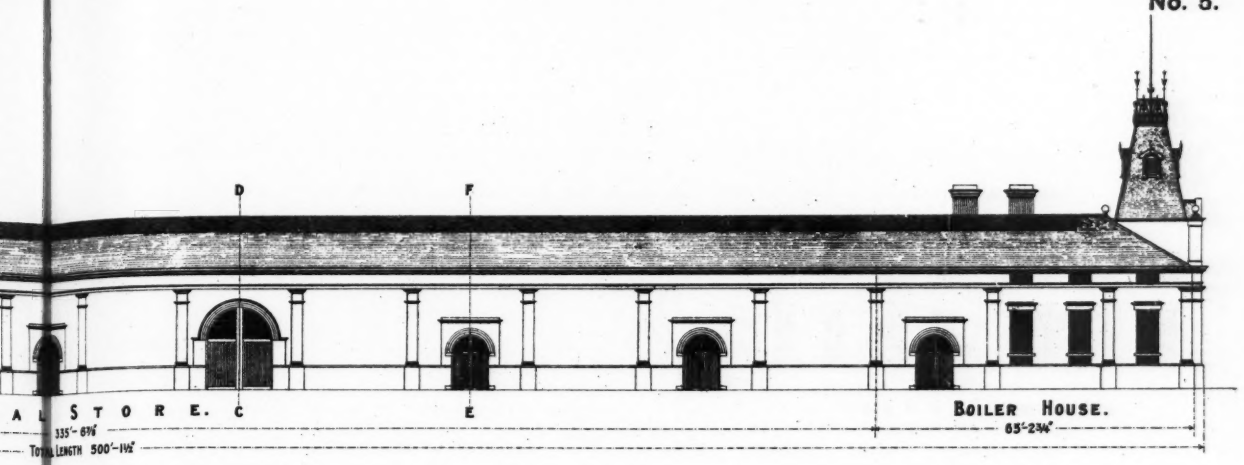


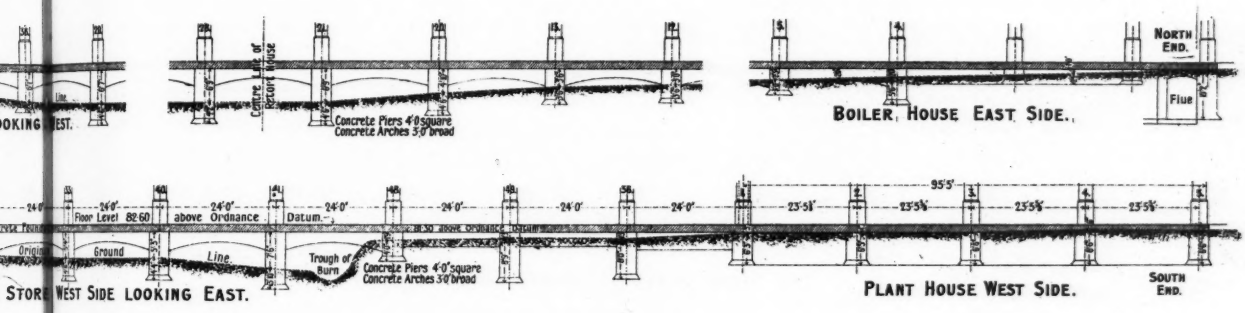
PLANT HOUSE SOUTH END.

Copyright at Stationers' Hall.

burgh and Leith Gas Commissioners.

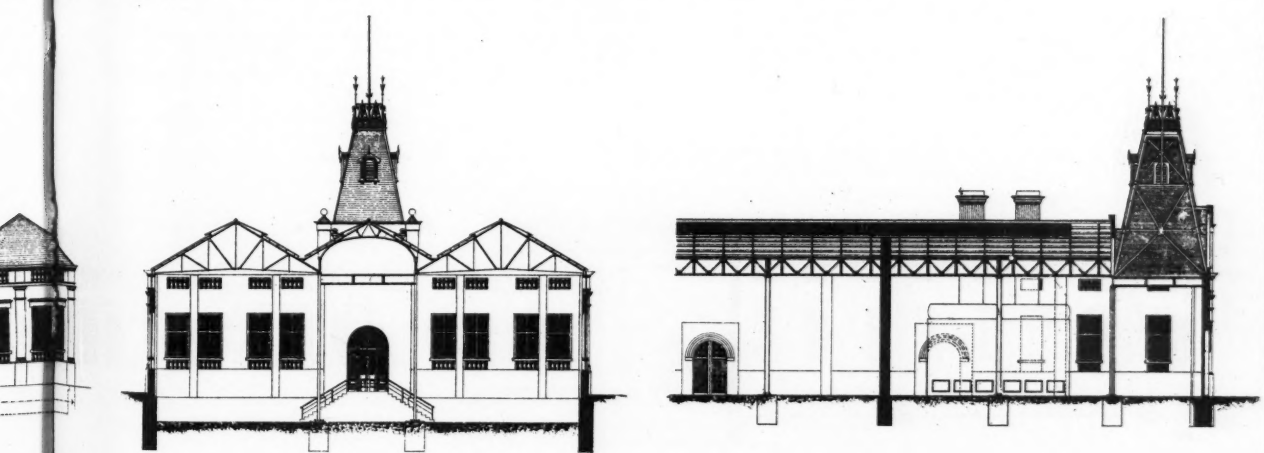
No. 5.





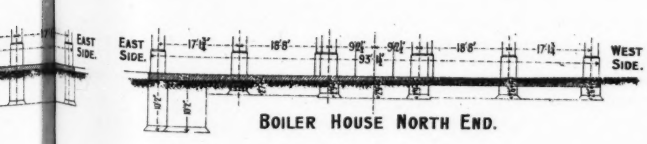
STORE WEST SIDE LOOKING EAST.

EAST ELEVATION.



TRANSVERSE SECTION OF PLANT HOUSE.

LONGITUDINAL SECTION OF BOILER HOUSE.



BOILER HOUSE NORTH END.

WALTER RALPH HERRING,
M.INST.C.E., ENGINEER.

WATER BILLS FOR 1903.

THE following Bills relating to water supply have been deposited in the Private Bill Office. As will be noticed, by far the greater number are promoted by Local Authorities. Only three Bills originate with Companies.

The Sutton District Water-Works Bill is to authorize the Sutton District Water Company to construct additional works, comprising a well and pumping-station in the parish of Woodmansterne, near Chipstead Station, with a service reservoir at Banstead—to be completed within six years. Additional capital to the amount of £100,000 is required, with one-fourth loan.

The West Sussex Water Bill is to incorporate a Company with a share capital of £24,000 and power to borrow £8000, for supplying water within a district of which Pulborough is the centre, which is at present without an adequate or proper supply. The powers of the Company are to be effectively exercised within three years. The sources of supply are to be wells in the parishes of Sutton and Fittleworth. The reservoirs to be constructed on common lands are to be placed underground, and the surface restored to its original level and sown with grass seed. Rates for domestic supplies are to range from 10 to 6 per cent. on the rateable value. The maximum price for water supplied by meter is to be 1s. 6d. per 1000 gallons, for public or private purposes.

The Winchester Water and Gas Bill contains a part relating to the water undertaking of the Company. The limits for the supply of water are to be extended—the service to be made effective in the added parishes within five years. Consumers of water are to be offered facilities to become shareholders in the Company.

The Barnsley Corporation (Water) Bill is to amend the provisions of the Barnsley Order, 1902, which authorizes the borrowing of £120,000 to complete works in progress. The period of repayment of this new loan was left in the discretion of the Local Government Board, who made it thirty years; and the purpose of the Bill is to alter the term to sixty years.

The Bath Corporation Water Bill is to empower the Corporation of the City of Bath to construct additional water-works, including a reservoir in the parish of Marshfield. The waters of certain springs are to be taken. The works are to be completed within ten years. Provision is made for the prevention of fouling. The Corporation desire power to purchase any private water-works within their area of supply. Additional water capital to the amount of £42,000 is required, to be repayable in sixty years.

The Belfast Water Bill is to enable the City and District Water Commissioners to borrow £10,000 and further sums, for the general purposes of their undertaking, including the payment of interest on loans for a period of ten years. The sinking fund payments are to be suspended for the same period. An authorized reservoir in the Mourne Mountains is to be altered. The district of supply is to be enlarged. It is explained in the preamble that the authorized Mourne Mountains water supply scheme of the Commissioners has proved greatly more costly than was anticipated; and as it is designed to benefit future generations of ratepayers, it is regarded as unfair that the greater part of the cost should fall upon the present generation, who will reap only a small portion of the benefit to be derived from it.

The Bury and District Joint Water Board is to authorize the construction by the Board, which was constituted in 1900, of additional works, comprising a reservoir to be called the New Hall Reservoir situate on the Scout Moor or Dearden Brook; a second reservoir on the same stream to be called the Scout Moor Reservoir; and a third, or high level reservoir, on the same watercourse. All the works will be wholly situate in the townships or parishes of Ramsbottom and Walmersley-cum-Shuttleworth, in Lancashire. Provisions are made for the discharge of compensation water in various circumstances. The lands required compulsorily are to be acquired within seven years. The rates for domestic supplies are to range from £10 to £6 13s. 4d. per cent., and are to be recoverable by action or distress. The maximum price of water sold by measure is to be 2s. per 1000 gallons. The existing statutory arrangements for the protection of the Haslingden Corporation are to be altered; and various provisions in local Water Acts are to be repealed. Additional water capital is required, including £195,000 for the purposes of the Bill, and £60,000 for general works extensions. The creation of Water Board stock is contemplated. The existing annuities are to be extinguished, and the finances of the Board rearranged. The constitution of the Board is to be amended, to enable members to be elected who do not belong to constituent authorities. Waste regulations are scheduled. Other schedules give the clauses of the Acts which it is proposed to repeal.

The Ebbw Vale Water and Improvement Bill contains a part relating to water supply, which contemplates the enlargement of the reservoir which at present impounds the waters of a tributary of the River Ebbw. The works are to be completed within seven years. Rates for domestic supplies are to range from 7½ to 5 per cent. on the rateable value. Additional water loans to the amount of £61,500 are needed.

The Harrogate Water Bill is to authorize the transfer of the Knaresborough Water-Works to the Corporation of Harrogate, in accordance with the terms of a scheduled agreement. The Knaresborough water limits are to be added to those of the Corporation. Parts of the transferred undertaking are to be resaleable to the Knaresborough District Council under certain conditions. Additional water capital to the amount of £10,000 is required. It appears that the reason for the transfer is that the Knaresborough supply is at present drawn from the River Nidd, below the spot on which the Corporation are authorized to construct sewage works; and it has been agreed that, to obviate any question as to the pollution of this supply, it should be relinquished and the district supplied by the Corporation.

The Hyde Corporation Bill is to enable the Corporation, among other things, to make better arrangements for the water supply of the town. Owners of occupied houses not provided with a proper and sufficient water supply are to be liable to a penalty of £5, and a daily penalty not exceeding 40s. Common pipes supplying two or more houses are to be subject to the inspection and control of the Corporation. Provisions are to be made for the care of cisterns.

The Kent Water Board Bill is for incorporating a Water Board, to consist of representatives of certain urban and rural district councils in Kent, for the purpose of taking over and administering portions of the undertakings of the Kent and Lambeth Water Companies. The proposed Board would consist of 23 members, representing the Kent County Council and various Metropolitan suburban localities, from Dartford to Bromley and Penge. The Clerk of the Beckenham Council would convene the first meeting. The Chairman might be chosen from outside the members of the Board, and be paid. The property of the Companies is to be acquired by arbitration under the terms of the London Water Act, 1902, and the special provisions of the Bill. Arrangements are proposed for bulk supplies to or from the parties to the scheme. The capital loan for the purchase of the property is to be repayable in 100 years. The Board are to have powers to promote or oppose Bills in regard to their undertaking.

The Leigh Corporation Bill contains a part relating to water. Additional water loans to the amount of £58,500 are required. An award of Mr. Joseph Parry as to the division of the property of the old Joint Water Committee for Leigh and Hindley is to be confirmed. The property is to be vested in the Corporation of Leigh and the District Council of Hindley respectively, and the Committee is to be dissolved. It is found that a better supply can be obtained from the Corporation of Liverpool, and arrangements are to be sanctioned accordingly for tapping the Rivington Aqueduct in the parish of Aspull. Rates for domestic supplies are to range from 10 to 6 per cent. on the rateable value.

The Merthyr Tydfil Urban District Council Bill contains a part relating to water-works. It is proposed to lay some additional lines of water-main, and to construct a new service reservoir on Merthyr Common and other works. The limits of supply are to be extended to include the part of the parish of Vaynor, which is outside the parliamentary borough of Merthyr Tydfil. Right of entry to cut off is required after seven days' vacancy; and the Corporation may require a separate pipe and stop-cock be laid from the main to every house. Power is sought to make bye-laws for securing the cleanliness and freedom from pollution of tanks, cisterns, and other receptacles used for storing water used, or likely to be used, by man for drinking or domestic purposes, or for manufacturing drink for the use of man. Additional water loans are required to the amount of £102,000.

The Nanty-glo and Blaina Water Bill is to authorize the Urban District Council to procure an independent supply of water instead of that which they at present obtain from the Ebbw Vale District Council. The proposed works comprise an existing reservoir on Llangattock Common (belonging to the Duke of Beaufort), which is to be enlarged. As compensation for collecting the waters of the River Clydach, there is to be discharged into the stream below the reservoir not less than 300,000 gallons per day. Rates for domestic supplies are to range from 10 to 6 per cent. The price of water supplied by meter is to be 2s. per 1000 gallons. The Brynmawr District Council are to have in perpetuity a right to a bulk supply of 100,000 gallons per day, at a maximum price of 4½d. per 1000 gallons. Water capital amounting to £68,000 is required. The agreement between the Council and the Ebbw Vale Council is to be annulable at six months' notice, on terms to be agreed or determined by arbitration under the Arbitration Act, 1889.

The Nelson Corporation Bill is to extend the time for the construction of certain water-works authorized by the Nelson Local Board Act, 1888, to ten years from the passing of the Bill. The usual provisions are to be made for the prevention of pollution of the source of supply. Additional capital amounting to £25,000 is needed to complete the authorized works, to be repayable in sixty years.

The New Hunstanton Improvement Bill contains a part relating to water. It defines the limits of supply to be the district and parishes of Hunstanton and Great Ringstead. Provision is made for the purchase of the reversion to leases of water rights held by the Council. Additional water-works are to be constructed within ten years. Hotels may be supplied by meter. Additional water capital to the amount of £12,000 is required, besides £627 for defraying further expenditure in connection

with the purchase of the undertaking of the Company under the Act of 1897.

The Oldham Corporation Bill is to authorize the Corporation to purchase the undertaking of the Commissioners of the Deanhead Reservoir, in accordance with an agreement scheduled. The reservoir is to be enlarged and supplemented with two others; the works to be completed within ten years. The Corporation are not to take any water from the stream known as Haigh Clough in the urban district of Marsden, in the West Riding. Compensation water is to be discharged into the River Calder. Additional lands and assessments are to be compulsorily acquired within five years. The Corporation are to pay £15,000 for the Deanhead undertaking; and they require £285,000 for works extensions and general purposes.

The Scunthorpe Urban District Council Water Bill is to authorize the District Council to construct water-works in substitution for those sanctioned by their Act of 1899. The source of the intended supply has been found to be unsuitable for the purpose, and a better one has been found outside the district. New works are contemplated, including a pumping-station and catchment in the parish of Roxby-cum-Risby, to be completed within seven years. Existing borrowing powers to the amount of £25,000 are to be made applicable to the new undertaking. Out of the moneys authorized to be borrowed for water-works purposes the Council desire to transfer £2000 to the credit of their gas undertaking—being the cost of working the pumps at the pumping-station.

The Sheffield Corporation Bill is to enable the Corporation to make a new aqueduct required for taking the Derwent water supply at a higher level than was originally intended, and to abandon the old plan. The supply is to be delivered at 700 feet above Ordnance datum. Fresh applications of the water revenue are proposed, to apply when the amount to the credit of the reserve fund is not less than £100,000. These objects are comprehensively described in the last definition as any purposes "which, in the opinion of the Corporation, will tend to the improvement of the city and the well-being of the inhabitants." The borrowing powers of the Corporation under the Water-Works Act of 1896 are to be increased to £1,289,108.

The Torquay Corporation Water Bill is to sanction the construction of a reservoir, to be called the Trenchford Reservoir, in the parishes of Christow, Bovey Tracey, and Hennock in Devonshire. The waters to be impounded are those of the Trenchford or Beadon Brook and Kenwick stream and all their tributaries. The works are to be completed within ten years. The maximum price for water supplied by meter is to be 1s. 8d. per 1000 gallons. An additional sum of £22,000 is required for water-works purposes.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 234.)

THERE was not much improvement last week in the general position of things on the Stock Exchange. At times they would flicker up and look as if they were going to be brighter, but nothing much came of it. The chief adverse influences were railway dividends, South African labour, and international relations. Consols were about the strongest market. The Money Market was very much easier, and rates, both for short loans and discount, were well relaxed, and a reduction in the Bank of England rate this week is being talked of. In the Gas Market, there was a good deal more activity, although operations were to a considerable extent in one issue only. The general tendency all round was favourable, and a fair number of improvements of moderate degree were made in quotations. The chief incident of the week was the announcement of the Directors of the Gaslight and Coke Company that they would recommend a dividend at the rate of £4 8s. per annum (making, with the £4 rate declared last August, a dividend of £4 4s. for the year 1902), and carry forward a balance of £3000 less than they did six months ago. As the increase in the dividend comes to about £30,000, this means that the balance available for dividend shows an increase of about £27,000. This announcement was received with satisfaction; and the ordinary stock, which had opened at 87, took a jump of a couple of points next day, and changed hands at 89¼. Then a good bit of dealing in the stock ensued; and though the price once touched 89½, that was its supreme effort, and the closing mark was 89. Of the secured issues, the maximum was also favourably affected, and rose a point. But the debenture and the preference were weak, and the latter receded a point. Some moderate dealing took place in South Metropolitan, and the price slowly hardened to 123¾; but the quotation was left standing unchanged. Commercial is still out of the list, awaiting official quotation. We hear that the Directors will promptly avail themselves of the powers of the Company's new Act, and hold the general meeting in mid-February; and thus will disappear the last surviving anachronism (hitherto imposed on the Commercial Company by their old Act) of a Metropolitan Company meeting to settle the affairs of a half year more than three months after its close. The Suburban and Provincial group were quiet and unchanged, except that Newcastle locally gained half a point. All the Continental Companies were quiet—Imperial advanced, and Union receded. Of the remoter undertakings, Melbourne, Monte Video, and River Plate improved. The Water Companies were inclined to be easier, and East London and Southwark slightly receded.

The daily operations were: Gas opened very quiet on Monday, and only River Plate advanced ¼. Tuesday was quiet too; but movements were more free. Gaslight ordinary rose 2, and ditto maximum 1; but the preference and Union fell 1 each. On Wednesday, Gaslights were very active, but unchanged. Imperial rose 1. Thursday's transactions were more moderate. Monte Video gained ½. In Water, East London fell 2, and Southwark 1. Friday was steady. Melbourne 5 per cents rose 1. Saturday was quiet and unchanged.

THE HEARD FUND.

First List of Contributors.

As promised last week, we give below a list of the contributions so far received in response to the appeal addressed on the 6th inst. to readers of the "JOURNAL" for assistance, in order that the small weekly pension which has been paid to the widow of the late Mr. Edward Heard for the past four years may be continued. In 1899, a fund of over £37 was raised; but this has now been more than exhausted, and it has therefore become necessary to secure a further supply of money if the helping hand which has been extended to the old lady is not to be withdrawn. The following sums have been received from friends who have kindly interested themselves in the matter; and we trust that further help may be forthcoming.

	£	s.	d.
Thomas Berridge (Leamington)	1	1	0
Chance and Hunt (Oldbury)	5	0	0
Clay Cross Company (Chesterfield)	0	10	0
A. Cooke (Oldbury)	0	5	0
W. R. Cooper (Banbury)	0	5	0
George Helps (Nuneaton)	0	10	0
Hucknall Colliery Company (Nottingham)	1	1	0
Charles Hunt (London)	1	0	0
Walter King (London)	2	2	0
Leamington Priors Gas Company	2	2	0
Lewis Demuth and Co. (Oldbury)	2	0	0
Sir George Livesey (London)	5	0	0
J. Birch Paddon (Neath)	3	3	0
Parkinson and Cowan (Birmingham)	2	2	0
Mrs. Robinson (Coventry)	5	0	0
"Sympathy"	0	2	6
W. T. Tew (Warwick)	0	10	0
Waterfall and Barber Sheffield)	0	5	0
Wilson Carter and Pearson (Birmingham)	1	1	0
	£32	19	6

Reduction of Price by the Commercial Gas Company.—The Directors of the Commercial Gas Company have decided to reduce the price of gas by 2d. per 1000 cubic feet, as from Christmas last. This is in connection with the lowering of the illuminating power of the gas to 14 candles on the 1st inst., in accordance with the provisions of the Company's Act of last year.

Gas from Oil.—We learn from the "Petroleum Review" that two new gas plants have been established lately in California for the manufacture of gas solely from crude petroleum. One is at Fresno and the other at Oakland, both owned and operated by the same concern, which has a contract for three years to supply the Oakland Gas Light and Heat Company with gas at a cheaper rate than that at which it has been made under the old process. The heavy fuel oil is pumped from a tank directly into generators, and the product is said to be a superior quality of gas.

Utilizing Chimney Smoke.—An American publication just to hand reports that in Brussels, Malines, and other Belgian towns, a novel method of not only getting rid of smoke, but turning it to good account, has recently been employed. The smoke, it is said, is driven by a ventilating fan into a filter filled with porous material, over which a continuous stream of petroleum, benzene, alcohol, or some liquid hydrocarbon flows. The result is that the smoke is entirely suppressed; while the filter yields a gas of great heating power, which can be used for domestic purposes and for driving gas-engines. The filtering material itself also becomes a good combustible during the process.

"Reports of Gas Associations" for 1902.—In accordance with the announcement which appeared in the "JOURNAL" last week, the above-named volume was ready on Thursday. As this is the twentieth issue, the nature of the book is well known to most of our readers. The present volume contains the reports of the proceedings at the meetings of the various District Associations of Gas Managers (including the "informal" gathering of Scottish Managers) last year, reprinted from the pages of the "JOURNAL." The text of the papers, which is illustrated by four folding plates and a number of diagrams, is preceded by an index, and followed by lists of the office-bearers and members of the Associations.

COMMUNICATED ARTICLE.

FANS IN GAS-WORKS.

By R. Gordon Mackay, Assoc.M.Inst.C.E., Member of the Berlin Section of the Society of German Engineers.

In order to increase the practical use of an article written under the above heading, the writer will deal with the subject matter categorically, and therefore will divide the whole into six parts, illustrated by drawings and photographs from actual practice. The various parts will be designated by the following headings:—

I.—A New and Concise Statement of the Theory of Centrifugal Fans, more Particularly Specialized to the Needs of Gas Engineers.
II.—The Gas-Plant Fan Blower.
III.—Application of the Fan for Gas Exhausting.
IV.—Boiler Draught.
V.—For Purposes of Gas Purification.
VI.—Ventilation.

Part I.—A New and Concise Statement of the Theory of Centrifugal Fans more Particularly Specialized to the Needs of Gas Engineers.

The term "fan" is in general used by makers for machines for the movement of air or other elastic fluids at low pressures, or more correctly against low resistance. Such a definition is, of course, very ambiguous to any but the expert in air-moving machines; and therefore it must be clearly understood that the term fan really should be applied only to a machine consisting primarily of a wheel mounted upon a spindle, and which when rotated causes a diminution of pressure at its centre by the direct action of the air being thrown off at its periphery, due to centrifugal force. The motion taken by the elastic fluid leaving the wheel is necessarily compounded of the motions due to tangential speed of tips and to centrifugal force. Thus the fan is evidently a practical application of the theory of centrifugal force to the benefit of mankind; and its various forms have now become so specialized to the demands which they must answer, that it is somewhat difficult to relegate them to their proper place in the great class of machines devoted to the movement, condensation, and rarefaction of elastic fluids.

Perhaps it would be difficult to find a better sub-division than the following—

(*a*) Machines for the movement of air, from the primitive bellows to the modern Bessemer air-engine, where the volume of air is impelled to move by the direct action of a plate or piston.
(*b*) Air-compressors of variety of forms and sizes for producing air compressed to many times the atmospheric pressure.
(*c*) Pumps for producing rarefaction either by direct suction or by condensation of a vapour.
(*d*) Rotary machines for the movement of air against resistances sometimes equivalent to 3 lbs. per square inch, but more generally less; the air or gas being impelled to move by a series of impacts caused by one or more blades fixed to a spindle and revolving inside a cylindrical casing.
(*e*) Fans for the movement of large volumes of the elastic fluid at exceedingly low pressures or of small volumes at pressures or against resistances equivalent to as high as 25 inches of water; the movement and pressure of the air being due to centrifugal force brought into action by the rapid rotation of the fan wheel which is built up of a number of vanes of a shape to assist the discharge of the air or gas from the periphery.
(*f*) Propellers which give to the medium in which they rotate an axial movement; this movement being dependent upon the speed of rotation and the pitch, and always being weak at the centre owing to inability to equalize the axial velocity of the medium throughout the plane of rotation. Such machines, unless they are built with a very large portion of the centre closed by a properly-shaped disc, are really not able to deliver appreciably against any resistance, it always being desirable to maintain an area throughout a duct system equivalent to that of the propeller.
(*g*) Induction blowers, such as steam-jet nozzles, where the high velocity of the escaping steam or compressed gas induces the surrounding medium to follow.

This article will deal almost entirely with section (*e*) or fans, though a short space will be given to air propellers. But engineers should really note the distinction between the two machines. The fan works upon the principle of centrifugal force, whereas the propeller produces an axial movement due to the principle of the screw.

The theory of the centrifugal fan, as set forth in the following, will clearly establish in a concise and somewhat novel manner the relations existing between the circumferential velocity of the wheel u in feet per second and—

H—the total pressure obtained in aq.
h—the resistance to be overcome in aq.
h_1—the dynamic pressure in aq.
o—the fan-wheel orifice, in square feet.
Q—the air or gas delivered in cubic feet per second.
a—the equivalent orifice in square feet which would artificially produce a resistance h.
P—the power absorbed in foot-pounds per second when delivering through o against h.

Total Pressure.—The theoretical total pressure due to the velocity of the air thrown off the tips of the wheel is obtained by the following formula—

$$H_o = \frac{v^2}{2g} \times \frac{\gamma}{\gamma_o} \times \frac{459 + 32}{459 + t} \times 12 \quad (1)$$

where v = velocity of air leaving tips in feet per second.
g = 32·2.
γ = weight of a cubic foot of the elastic fluid in pounds at 32° Fahr. and 30 inches hg. barometric pressure.
γ_o = 62·3 lbs. weight of a cubic foot of water at 32° Fahr.
t = temperature in degrees Fahr.
459° = the absolute temperature in degrees Fahr.
H_o = inches of water—the most convenient English measure of small pressures.

It has already been stated that the velocity of the air leaving the tips of the fan-wheel is compounded of two velocities—one due to centrifugal force, and acting in the direction of the vane; and the other due to the tangential velocity of the wheel, and acting, of course, at a tangent to the wheel's circumference. Therefore v has a value determined by the compounded values of the component velocities.

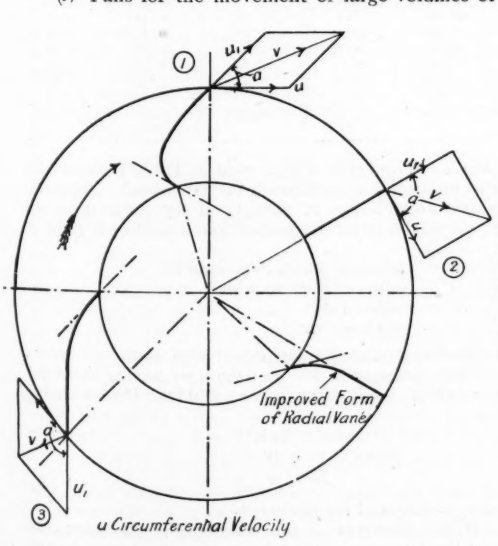


Fig. 1.

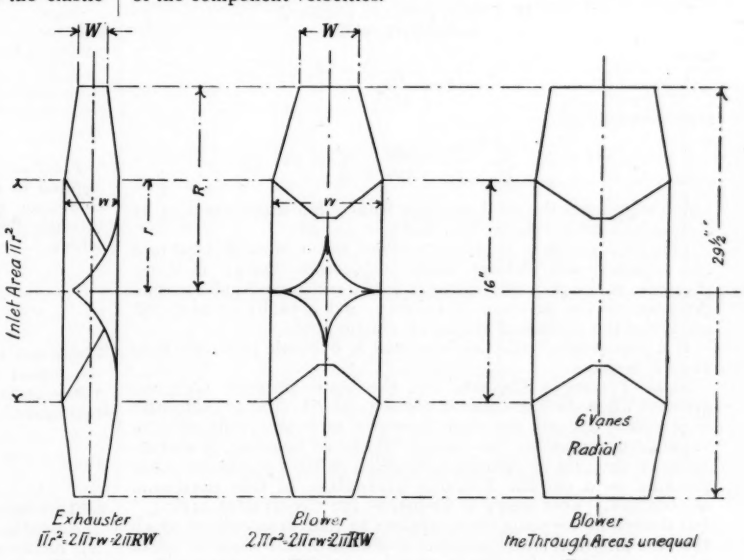


Fig. 2. Fig. 3. Fig. 4.

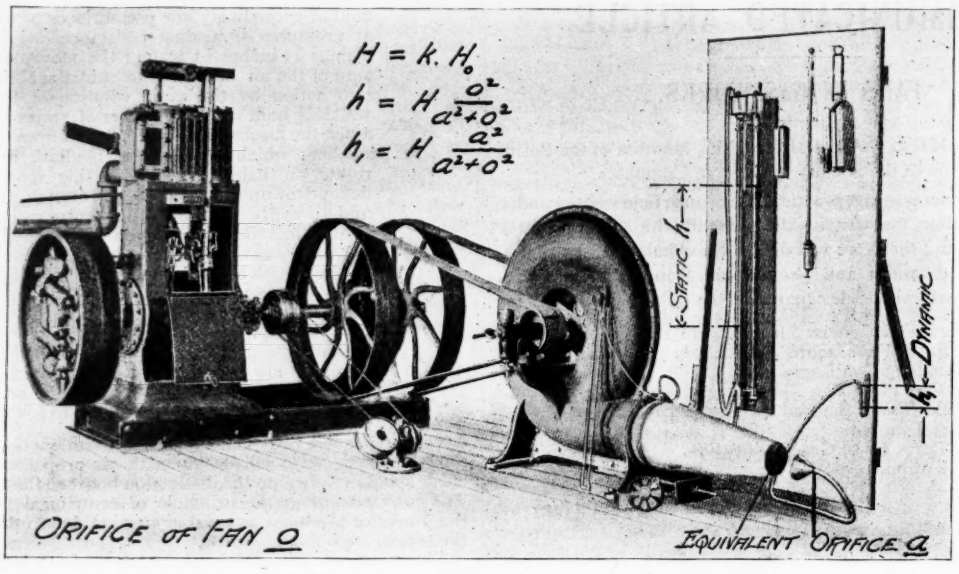


FIG. 5.

If $\propto$ represent the angle of inclination of the vane to the tangent, then

$$v = \sqrt{u^2 + u^2 + 2uu, \cos \propto}$$

where u = tangential velocity or speed of tips
and u_1 = velocity along the vane due to centrifugal force.

Fig. 1 shows three forms of vanes, of which No. 1 is curved concave to the outlet of the fan; and therefore cos $\propto$ becomes a positive quantity. The manometric yield of a fan-wheel with many such vanes, when every precaution is taken to introduce the air without shock, may be taken as about 87 per cent. Figs. 2 and 3 show a radial blade—the simplest and cheapest to make, and very largely used in carburetted water-gas plants for blowing the generators. The manometric yield of such a vane may be taken as 60 per cent. Fig. 4 shows a vane convex to the fan-outlet, and cos $\propto$ becomes therefore negative. The manometric yield here is sometimes as high as 50 per cent., varying with the shape and number of blades—being sometimes as low as 39 per cent.

With a radial blade, since $\propto = 90°$ the quantity $2uu$, cos $\propto$ is eliminated; and since the velocity due to centrifugal force equals the tangential velocity,

$$v = \sqrt{2u^2},$$

and consequently the formula for the theoretical total pressure becomes

$$H_o = \frac{u^2}{g} \times \frac{\gamma}{\gamma_o} \times \frac{459 + 32}{459 + t.} \times 12 \quad (2)$$

This theoretical total pressure cannot be obtained in practice, owing to eddies, shocks, and skin friction, though care in admitting air to the wheel in a blower largely reduces the loss of pressure due to impact,

Let H = total pressure obtained
k = manometric yield

then

$$k = \frac{H}{H_o}$$

and accordingly

$$H = k \quad \frac{u^2}{g} \quad \frac{\gamma}{\gamma_o} \quad \frac{459 + 32}{459 + t.} \times 12 \quad (3)$$

which represents the total pressure from a fan-wheel running at a circumferential velocity of u feet per second.

This total pressure is always exerted, but is often divided into two separate and distinct kinds of pressure, known as static pressure, or the pressure due to an actual resistance, and dynamic pressure, or the pressure of velocity, and actually causing the motion of the volume of the air or elastic fluid.

If h represents static pressure and h_1 dynamic pressure, then $H = h + h_1$.

Static Pressure.—Theoretically, the static pressure becomes greatest when the fan-outlet is entirely closed; and as this outlet is gradually opened, the static pressure, of course, falls off—the value of a remaining the same. There is, however, a certain value of the area of opening a at which either a maximum static pressure or a certain desirable percentage of this maximum is obtained. This area a is known as the "equivalent orifice;" but though its meaning really applies to that area only at which the best practical static pressure is obtained, it is usual to speak of the variation of the static pressure with increasing values of a.

If o be the smallest area through the fan-wheel, then

$$h = H \frac{o^2}{a^2 + o^2} = H \quad \frac{1}{1 + \frac{a^2}{o^2}} \quad (4)$$

The values of this fraction therefore represent the values of the static pressure when H is unity.

Dynamic Pressure.—From a consideration of the foregoing remarks concerning static pressure, it follows that dynamic pressure becomes greatest when there is no resistance at all to be worked against, and consequently its maximum is only reached when the fan-wheel runs absolutely free—that is to say, without any casing. Now since $H = h + h_1$, by inserting the value of h given in equation (4) the value of the dynamic pressure becomes—

$$h_1 = H \frac{a^2}{a^2 + o^2} = H \frac{1}{1 + \frac{o^2}{a^2}} \quad (5)$$

In making calculations on fans, this h_1 is a very important factor, since to it the movement of air is due. If, for instance, a be infinitely great (a contingency only arrived at when the fan casing is removed), the dynamic equals the total pressure, and the maximum volume of air is moved or discharged from the tips of the fan-wheel. If, on the other hand, a be zero, then h_1 vanishes altogether, and no air is delivered from the fan.

Table I. gives the values of these fractions for given ratios of a and o.

TABLE I.

$\frac{a}{o}$	$\frac{1}{1 + \frac{a^2}{o^2}}$	$\frac{1}{1 + \frac{o^2}{a^2}}$	$\frac{a}{o}$	$\frac{1}{1 + \frac{a^2}{o^2}}$	$\frac{1}{1 + \frac{o^2}{a^2}}$
	Static.	Dynamic.		Static.	Dynamic.
zero	1·00	zero	1·20	0·41	0·59
0·20	0·96	0·04	1·40	0·34	0·66
ratio 1 : π	0·91	0·09	1·60	0·28	0·72
0·40	0·86	0·14	1·80	0·24	0·76
0·60	0·73	0·27	2	0·20	0·80
0·80	0·61	0·39	4	0·06	0·94
1·00	0·50	0·50	infinity	zero	1·00

The Fan Orifice.—The value of o as used in Table I. should be applied to the minimum area through the fan-wheel. Suppose, to reduce eddies and change of velocity of the air as it passes through the wheel, the latter be proportioned as shown in fig. 2, where

R = radius of wheel over vanes
r = radius of inlet to wheel
W = width of tips
w = width of *ouïe*

where *ouïe* is used to denote the peripheral area as the air enters the region of the vanes, then for an exhauster having one inlet $\pi r^2 = 2\pi rw = 2\pi RW = o$ the fan-orifice; and for a blower having two inlets

$$2\pi r^2 = 2\pi rw = 2\pi RW = o$$

thus

$$\frac{r}{R} = \frac{W}{w}$$

and for fig. 2, $r = 2w$; and for fig. 3, $r = w$.

Example.—If the diameter of the wheels over the vanes be 29½ inches and the diameter of the inlet to the wheel be 16 inches, then for fig. 2 the width of *ouïe* is 4 inches and the width of the

tips is $2\frac{1}{8}$ inches; the orifice of the wheel being 202 square inches. For fig. 3, where the wheel has two inlets, the width of *ouïe* should be 8 inches, and the width of the tips $4\frac{1}{4}$ inches; the area of the orifice being 404 square inches. Fig. 4 shows the proportions of the fan-wheel used at the Hornsey Gas-Works, where the width of the *ouïe* is $9\frac{3}{4}$ inches and the width of the tips $7\frac{1}{2}$ inches—in each case unnecessarily large, and more so in view of the fact that one of the inlets is choked by the driving-pulley 9 inches diameter, and the other by the journal $2\frac{3}{4}$ inches diameter, thus reducing the fan-orifice to 322 square inches, though the tip area is as much as 706 square inches. The inlets of a blower should be proportioned as large as possible to reduce the suction exerted. The outlet of an exhauster should also be as large as can be conveniently made, to reduce the pressure of the discharged air. The amount of surface of the blades naturally plays a great part. Fig. 5 shows an arrangement adopted by a prominent fan maker for testing the performance of his fans through a discharge equivalent orifice *a*.

With such an arrangement, it necessarily becomes difficult to eliminate the effect of dynamic pressure; and a better result is therefore obtained by first discharging the air into a large box, with final escape through a convergent conical tube.

Volume Discharged.—The volume discharged by a centrifugal fan-wheel when running without its casing and discharging free into the atmosphere, is very easily calculated, and is

$$u\sqrt{2k} \times \text{orifice of fan} \times 0{\cdot}65$$

where u = circumferential velocity in feet per second.
k = manometric yield.
o = fan orifice.
0·65 = co-efficient of *vena contracta*.

The value of k depends, of course, largely upon the surface of the blades. It may be reasonably calculated from the formula for radial blades

$$k = \frac{R^2 - r^2}{R^2}$$

and in practice is greater when the blades are continued to the hub of the wheel.

When, on the other hand, the fan discharges a volume of air against a back-pressure or resistance or static pressure of h, where

$$h = H\,\frac{o^2}{a^2 + o^2}$$

then the dynamic pressure, giving to the air its motion, is

$$h_1 = H - h = H\,\frac{a^2}{a^2 + o^2}\,.$$

But the velocity due to h_1 dynamic pressure is calculated from the formula

$$\sqrt{2gh_1\,\frac{\gamma_0}{\gamma}\,\frac{459 + t}{459 + 32}\,\frac{1}{12}}$$

And substituting in the formula the value of h_1 deduced from (5) and (3), the expression becomes

$$\sqrt{2ku^2\,\frac{a^2}{a^2 + o^2}}$$

or, as it is more generally written,

$$a.u.\sqrt{\frac{2k}{a^2 + o^2}}$$

which is the velocity of the stream of air passing through the fan orifice o. And accordingly the volume of air passed through becomes

$$Q = 0{\cdot}65\ o.a.u.\sqrt{\frac{2k}{a^2 + o^2}} \qquad (6)$$

when, if o and a be in square feet and u in feet per second, Q is cubic feet per second delivered by the fan against a back-pressure equivalent to h inches of water.

Equivalent Orifice.—The value of a, the equivalent orifice, may be deduced from this formula in terms of the volume and static pressure, as follows:—

$$a = \sqrt{\frac{1}{2k}\,\frac{Q^2}{0{\cdot}65^2\,u^2}\,\frac{a^2 + o^2}{o^2}}$$

But from formulæ (3) and (4)

$$ku^2 = \frac{gh}{12}\,\frac{\gamma_0}{\gamma}\,\frac{459 + t}{459 + 32}\,\frac{a^2 + o^2}{o^2}$$

Whence

$$a = \frac{Q}{0{\cdot}65\sqrt{2\,gh\,\frac{\gamma_0}{\gamma}\,\frac{459 + t}{459 + 32}\,\frac{1}{12}}} \qquad (7)$$

Power Absorbed.—The theoretical power absorbed by moving a volume of air Q with a total pressure equivalent to H inches of water is—

$$P = Q \times 5{\cdot}2\ H \text{ foot-pounds per second} \qquad (8).$$

Now, for a certain speed of wheel u feet per second, H the total pressure varies with the density; so that the power absorbed by merely moving a quantity of air, Q, varies inversely as the absolute temperatures.

If instead of delivering a volume Q at $t°$ Fahr., it be required to deliver a volume say at $t_1°$ Fahr.—as, for instance, when handling a hot volume by the same fan and through the same ducts—the power may be proved to vary as the square of the absolute temperatures, as follows.

The required new volume becomes—

$$Q\,\frac{459 + t_1}{459 + t}$$

So that, inserting this value in formula (6), the new value for u becomes—

$$u\,\frac{459 + t_1}{459 + t}$$

From formula (3), H becomes—

$$H = k\,\frac{u^2}{g}\left(\frac{459 + t_1}{459 + t}\right)^2\,\frac{\gamma}{\gamma_0}\,\frac{459 + 32}{459 + t} \times \frac{459 + t}{459 + t_1}\,12$$

And consequently the new value of P is—

$$P = Q\left(\frac{459 + t_1}{459 + t}\right)^2 \times 5{\cdot}2\ H$$

demonstrating that the power varies as the square of the absolute temperatures of the air moved. This will be further mentioned in Parts II. and IV.

In concluding this portion of the article, the relations between the circumferential velocity u and the three quantities—

The volume of air . . . . . Q
The total pressure . . . . . H
The power in the air . . . . . P

may be set down as follows:—

$$\text{From (6)}\ \frac{Q}{u} = \frac{0{\cdot}65\ a.o\sqrt{2k}}{\sqrt{a^2 + o^2}} = \text{constant.}$$

$$\text{From (3)}\ \frac{H}{u^2} = \frac{k}{g}\,\frac{\gamma}{\gamma_0}\,\frac{459 + 32}{459 + t}\,\frac{1}{12} = \text{constant.}$$

And multiplying these together, and inserting in (8)

$$\frac{P}{u^3} = 5{\cdot}2\,\frac{0{\cdot}65\ a.o\ \sqrt{2k}}{\sqrt{a^2 + o^2}}\,\frac{k}{g}\,\frac{\gamma}{\gamma_0} \times \frac{459 + 32}{459 + t} \times \frac{1}{12} = \text{constant.}$$

Or, in other words—
The quantity of air varies as the speed of the tips.
The total pressure of air varies as the speed of the tips^2.
The power absorbed by air varies as the speed of the tips^3.

It must be borne in mind, in making these calculations, that k for the same wheel is not a variable quantity, but always refers to the ratio between the actual total pressure H and the theoretical total pressure H_0. The total pressure H for a certain u is invariable, and may be found generally by measuring the static pressure with closed outlet, when since

$$h = H\,\frac{o^2}{a^2 + o^2}$$

if a be zero, then $h = H$. For radially tipped vanes, k varies from about 60 to 70 per cent., and throughout the following will be numerically considered as 0·60, which is a fair value for a wheel with straight radial vanes of about six in number, and where the orifice of the fan-wheel is not maintained throughout the wheel.

The writer has purposely adopted for k the expression manometric yield, thus following the same lines as adopted by Daniel Murgue in "Theories and Practice of Centrifugal Ventilating Machines," and also used by A. von Ihering in "Die Gebläse." It must not be confused with the "manometric power" of Professor Rateau, nor with the "pressure efficiency" used by the late Mr. Bryan Donkin in his "Experiments on Centrifugal Fans."

Experiments carried out by the author in Berlin gave k as 0·80 when the blades were deepened to the hub of the fan-wheel, or

$$H = 0{\cdot}80 \times 0{\cdot}000455 \times u^2 = u^2 \times 0{\cdot}000364$$

or by a peripheral speed of 100 feet per second the suction by closed inlet was 3·64 inches of water.

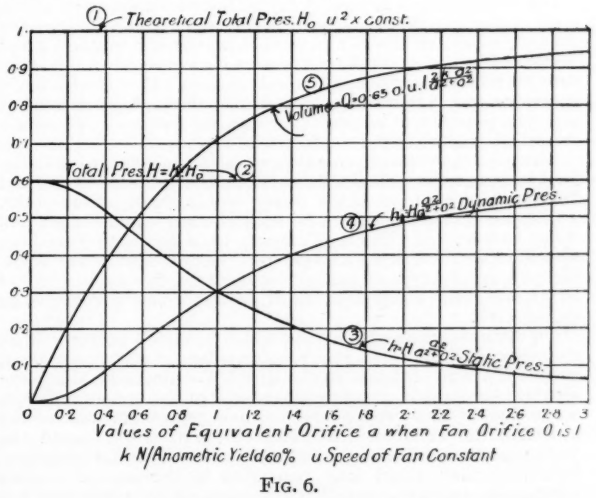

1 Theoretical Total Pres. H_0 u^2 x const.
5 Volume = Q = 0·65 o.a. $\sqrt{2k\frac{a^2}{a^2+o^2}}$
Total Pres. $H = k H_0$ 2
4 $h = H\frac{a^2}{a^2+o^2}$ Dynamic Pres.
3 $h = H\frac{o^2}{a^2+o^2}$ Static Pres.
1
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0 0·2 0·4 0·6 0·8 1 1·2 1·4 1·6 1·8 2· 2·2 2·4 2·6 2·8 3
Values of Equivalent Orifice a when Fan Orifice O is 1
k N/Anometric Yield 60% u Speed of Fan Constant

FIG. 6.

Fig. 6 concludes Part I. It shows graphically the theoretical variations of the pressure and volume with varying equivalent

areas. Curve 1 is a horizontal straight line representing the maximum theoretical pressure H_0. Curve 2 is also a straight line parallel to the horizontal axis, and represents total pressure $H = k H_0$. Curve 3 shows the variation of the static pressure, which is used up by overcoming the resistance due to the equivalent orifice. It is measured by the formula $h = H\frac{o^2}{a^2 + o^2}$. Note its maximum value H, when a is zero. [See Table I.] Curve 4 represents the change in dynamic pressure $h = H\frac{o^2}{a^2 + o^2}$. Note it has for asymtote the value H, when a is infinitely great. Curve 5 shows the variation of volume Q. It has for asymtote the value $0{\cdot}65 \times o.u \times \sqrt{2k}$.

The lengths of the ordinates contained between Curves 2 and 3 represent the "head" causing the movement of the air Q; they are equal to the ordinates of Curve 4.

TECHNICAL RECORD.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The members of this Association mustered in strong force on Saturday for the purpose of visiting the works of the British Westinghouse Electric and Manufacturing Company, Limited, Trafford Park, Manchester, which the management had thrown open for their inspection during the afternoon. They were received by representatives of the Company, and in two parties were conducted through the various departments of these very extensive works, which are the most notable illustration of the introduction into this country of American methods and enterprise, which has been steadily progressing during the last four or five years. The works, which were built throughout from American designs and almost entirely equipped at the outset with American tools (recently, however, it may be added, a considerable number of English tools have been, and are still being, introduced), occupy some 130 acres of land. The main shops are located in six buildings, all of rectangular shape, and arranged side by side in the order most convenient for securing straightforward work.

On the extreme east is the iron foundry, followed next in order by the brass and malleable iron foundries, the pattern shop and stores, the steel foundry and forge, the drying and dipping shed, the electrical power generating station, the machine shop, and, finally, the box factory. In all departments electric power is used wherever any possible benefit can be gained, either in accelerating the rate of production or reducing cost. The largest—and which, to the visitors, was the most generally interesting of the different sections of the works, all of which were gone through—was the machine shop, which, it is claimed, is the most extensive single engineering shop in the country. It is 900 feet long and about 450 feet wide, arranged in five longitudinal bays. Three of these bays are two storeys high, and two are one storey—clear from floor to the roof spans. There is also an intermediate gallery or mezzanine floor in the two storey bays devoted to lavatories, clothes' lockers, and general conveniences of the workpeople engaged in the machine shop. The galleries above the lavatory mezzanine are given up to smaller detail working. In other parts are innumerable small tools engaged on a wide variety of operations.

The heaviest work is carried out in the two main bays, where some of the largest tools at present in use in this country have been put down, all of which have been imported from the United States. The power supply of the works is arranged on the alternate current three-phase electrical system. The electricity is generated and distributed in the form of three-phase current at 400 volts pressure, at 25 periods per second frequency, by steam-driven alternators of the rotatory field type.

Although the present generating plant is entirely steam, in the further extensions which will be necessary, and are at present being carried out to meet the power requirements of the works, arrangements are being made for reciprocating steam-engines and steam turbines (of which the Company have now commenced the manufacture), and there are also to be installations of the Westinghouse special type of gas-engine, plant for the manufacture of which was being completed, but at present is chiefly engaged on repair work.

On the conclusion of the visit, which occupied pretty well all the afternoon, Mr. Hill, the Vice-President of the Association, proposed a vote of thanks to the British Westinghouse Company for their kindness in granting permission to the members for an inspection of their works, and to their representatives for the attention the members had received in the tour round the various sections. He was sure the members had that afternoon seen what they would long remember in the way of modern engineering enterprise and in the vastness of the works they had been privileged to so freely inspect. Mr. Berry seconded the vote, which was unanimously accorded; and one of the Company's representatives briefly expressed their acknowledgments.

In the evening, the members held their usual monthly meeting in one of the lecture rooms at the Manchester School of Technology—Mr. HALLEWELL, the President, occupying the chair.

The minutes of the previous meeting having been confirmed, a question concerning the status of membership in the Association, which for a considerable time past has engaged serious attention, and which raised the point whether membership should be limited to those who are directly engaged in the management of gas-works and the manufacture of gas, was brought forward for discussion.

The PRESIDENT said the matter was one for very serious consideration. It had been rather a distasteful duty for the Board to take up, but there was undoubtedly a strong feeling that there should be some amendment of rule 5 with reference to the qualification for membership. At present, rule 5 ran as follows: "Qualification for Membership.—Any person employed in the manufacture or distribution of coal or water gas, or the working up of their residuals, or in the manufacture of gas appliances, shall be eligible for membership." A proposed amendment of this rule would be put before them, which would require their very careful consideration.

Mr. SMITH then moved that rule 5 be altered so as to read as follows: "Persons employed in the manufacture or distribution of coal or water gas shall be eligible for membership."

Mr. BARLOW seconded the motion, which, he said, had received the most earnest consideration of the Council, and which it was thought was in the best interests of the Association.

There was no opposition to the proposed amendment of the rule; and the motion was adopted unanimously.

Mr. BERRY next moved "That rule 5, as amended, shall not apply to existing members of the Association." The matter had been very carefully gone into, he said, and there was no desire to exclude any of their existing members, between all of whom very good relations existed.

Mr. GARLICK seconded the motion, which was also adopted unanimously.

The PRESIDENT said there was another subject which had been brought before the Council, and which was of special interest to the members.

Mr. SMITH said that for a considerable time past the Council had had under consideration the ways and means of increasing the usefulness of the Association to its members. One of the principal objects of the Association was to assist the members in obtaining a technical knowledge of their profession; and with the view of obtaining increased facilities to this end, they had been in communication with the Gas Institute and the City and Guilds Institute. The conclusion they had come to was that the members might perhaps help themselves better than by seeking help from others; and it was suggested that they should form a class among themselves for the purpose of studying specially the engineering branches of their profession. They could not get the particular and special knowledge they required in the technical schools without studying many subjects which were not of special value to them and which involved waste of time and money. What they wanted was a thoroughly practical gas engineer to take up in a class the subjects directly connected with gas-works construction, and the various details of the particular branch of work. If they could form a class of this description, and secure a thoroughly practical man to take charge of it, he was confident it would be of great benefit to the members.

The PRESIDENT said the matter had received very serious consideration by the Council. At present, there were no special facilities for obtaining the particular information with regard to engineering directly connected with gas manufacture without wading through a great deal of matter that had no direct application to their real requirements. In gas manufacture they wanted both chemical and mechanical instruction; and it was in the latter branch that they were anxious to secure more facilities for gaining the technical training they required.

Much discussion followed, in which all the members agreed as to the advisability of providing some means by which special technical training in gas engineering could be secured, but some of whom doubted whether the Association were in a position to set on foot a class simply for its own members.

Mr. STODDARD suggested that perhaps the best course would be to obtain a return of the members who would be prepared to join a class such as proposed; and when they had obtained this return, if the number justified them in so doing, to approach Mr. Reynolds, the Principal of the Manchester School of Technology, and ascertain whether he would institute such a class as they required. Mr. Reynolds had been a good friend to the Association, and he was sure he would endeavour to meet their views if he possibly could.

After some further dissussion, Mr. Stoddard's suggestion appeared generally to commend itself; and having been put in the form of a resolution, it was unanimously adopted—the Council, and Mr. Stoddard acting with them, being instructed to at once take the requisite steps for carrying the suggestion into effect, and to report to the next meeting.

This closed the proceedings.

"Journal" Index.—The index to Volume LXXX of the "JOURNAL" is now ready; and subscribers can have copies, post free, on application to the Publisher.

WHY MILWAUKEE DID NOT BUILD INCLINES.

A Letter by Mr. Herring.

In the "JOURNAL" for the 9th ult., we reported the discussion on the paper read by Mr. R. B. Brown before the American Gaslight Association, entitled "Why Milwaukee did not Build Inclines," the text of which appeared in our issue for Nov. 4. The last number to hand of the "American Gaslight Journal" contains the following letter from Mr. W. R. Herring, which deals with some of the statements made at the meeting.

To the Editors of the "American Gaslight Journal."

You will, I am sure, permit me to address you in order to correct one or two misstatements, made in the course of a discussion on Mr. Brown's paper on the question of inclined retorts.

Mr. Littlehales is lamentably wrong in his references to the working at Edinburgh and Glasgow. In the year named (1900), I had only two settings of 18 retorts working on the inclined principle, among 992 horizontal retorts, working partly by machinery and partly by hand. Mr. Littlehales' comparisons, and the conclusions he draws from them, are, therefore, fallacious. At the same time, I would like to ask what possible bearing the cost of coal and the returns for residual products can have upon the question of the cost of charging coal into the retorts and drawing the resulting coke therefrom.

Mr. Littlehales' experience in this country should have made him aware of the fact that the price of coal and the return for residual products vary in almost every case—in that of coal, from $1·30 to $6 per ton of 2240 lbs., depending upon the part of the country to which it is delivered; and the return for residual products is equally variable. The illuminating power of the gas supplied in different parts also varies from 14 up to 26 candles. Even between Edinburgh and Glasgow, the illuminating power is 25 candles in Edinburgh and 20 candles in Glasgow. In fact, there are innumerable conditions affecting the price of materials in different localities, which make a comparison under such a heading impossible. To attempt to compare Edinburgh with Glasgow, and much more so with Sheffield, under these headings, and then to argue that machine-charged horizontal retorts are more economical than inclined retorts, is a process of reasoning I regret I cannot follow.

Mr. Brown himself also appears to have suggested that I have figured on obtaining from inclined retorts just as good work with the same coal as the horizontals were doing, and putting the labour on inclined retorts below that of horizontals. There is no doubt about the same coal yielding results fully equal, if not slightly superior, when carbonized in inclined retorts as compared with the horizontal system. I have proved this frequently, and again quite recently in Edinburgh. Neither is there any doubt whatever as to the labour costs being considerably less; my general experience being that these can be reduced by one-half as compared with the former costs for hand labour, and about 25 per cent. less than the former costs of machinery. The figures from my own working results at Granton at the present time, when I choose to publish them, will be highly interesting to all. As we have only been working about three months, I prefer to have a winter's experience before publishing any results whatever, excepting to say that they are of a highly satisfactory character.

The point at issue is as to the relative costs involved in labour in manipulating a ton of coal from its receipt at the retort-house to the discharge of the coke and the refuse therefrom into the yard—a question in no way involved in the cost of material. To avoid the slightly varying rates for wages in different localities, the figures might be stated in tons of coal manipulated per man per day of a given number of hours' work.

I am very much tempted, did time permit, to deal with many points raised in the discussion—such as the lessened yield of gas per ton of coal and of a poorer quality, furnaces requiring more fuel, retorts being more difficult to repair, and the greater cost to maintain the retorts. All of these have such a striking resemblance to the phantoms which have been so often raised on this side of the water, and which have been finally laid low by those who have had a lengthened experience with the inclined retort system, that I need not say more than that they are the inevitable outcome of defective constructional work and design, and would result in an equal degree from a horizontal bench put up by inexperienced hands from a design by an inexperienced party.

Edinburgh, Dec. 17, 1902. W. R. HERRING.

THE GAS INDUSTRY AND THE MANUFACTURE OF CYANIDE.

At the close of the last article on this subject (*ante*, p. 165), it was stated that the improvements made upon the Gautier-Bouchard process of treating spent purifying material related to lixiviation and the transformation of the material into ferrocyanide of potassium. These the authors proceed to consider.

The principal operations involved are: (1) Lixiviation and recovery of ammonia; (2) transformation of insoluble ferrocyanides into soluble ferrocyanide (calcium or sodium); and (3) transformation of ferrocyanide of calcium or sodium into ferrocyanide of potassium.

The object of lixiviation is to eliminate the soluble salts, the sulphocyanides of iron and of ammonium, and the sulphates of ammonia and iron. The operation is performed in filtering vessels—generally arranged in sets of eight—made of iron or wood, and having a capacity of 2500 to 3000 kilos. They have a double bottom formed of a wooden frame resting on girders. This frame is covered with a layer of twigs or straw, 4 inches thick, which is in turn covered with cotton or jute. The double bottom is furnished with a cock for running off the liquid into a gutter, which communicates by openings, closed by taps, with three tanks. These, for convenience, may be called A, B, and C. The following is the process: The material is shovelled into the vessels and water conveyed to the first of them, so as to well cover the contents. After remaining from 12 to 24 hours, the liquid is run into the gutter, and thence into tank A. From this it is pumped into the second vessel, while pure water is poured into the first. After 24 hours, the liquid is run from the second vessel to tank B, and thence pumped to the third vessel. The liquid is then run from No. 1 into tank A, and pumped to No. 2, and so on. At the end of the operation, the lyes have a strength of from 10° to 14° Baumé, and contain about 40 grammes of ammonia per litre. They are pumped from tank C to a reservoir above, whence they are drawn for distillation. After this operation, sulphocyanide of calcium remains in the distilled solution, subsequently transformed into sulphocyanide of potassium.

Transformation of the insoluble into soluble ferrocyanides can be performed in two ways—viz., in an apparatus furnished with an agitator, and in filtering vessels similar to those employed for the first lixiviation of the material. The agitating apparatus is a cast-iron boiler, of sufficient capacity to hold from 2 to 3 metric tons of material. Diluted lyes are first run into the boiler, and then from 2 to 3 tons of material. The agitator is set to work, and steam allowed to enter. The mixture flows into filter-presses to separate the ferrocyanide solution which still contains from 20 to 50 grammes of ferrocyanide, expressed as K_4 Fe $(CN)_6$. The material is first pulverized with a crusher, screened, mixed with lime and soda in variable proportions, according to the composition of the material, previously carefully analyzed, and then treated in the boiler. In the filtering vessels the operation is as follows: The lixiviated material is left for several days in the tanks to drain, and then spread out to dry on level cement or asphalte floors. Drying is accelerated by frequently stirring with a spade, which also crushes the fragments. When all is dry, it is screened, and closely mixed with powdered slaked lime in a proportion determined by previous analysis of the material. The mixture is then placed in the filtering vessels, eight to ten in number, arranged like those for the first lixiviation, and treated in the same way. The lyes obtained are of 12° to 14° Baumé strength, and contain 120 to 140 grammes of K_4 Fe $(CN)_6 + 3$ H_2O per litre; whereas with the agitator apparatus the solutions contain only from 40 to 50 grammes of this salt.

In the precipitation of the ferrocyanides, the lyes from the agitator apparatus contain calcium and sodium ferrocyanides, and those from the filtering vessels calcium ferrocyanide, Ca_2 Fe $(CN)_6$. They both also contain sulphocyanides of calcium and ammonium; and their treatment is intended to effect precipitation of the ferrocyanides. This may be done in three ways—viz., by the aid of iron salts, by ammonia salts, and by potassium chloride. By the first, the ferrocyanides are precipitated as prussian blue. When solutions only contain calcium ferrocyanide, they are merely treated with ferrous or ferric chloride; and when they contain ferrocyanide of sodium, with sulphate of iron. The solutions from the agitator apparatus always contain sulphides which are alkaline owing to the presence of free ammonia. They are acidulated in a special tank, and allowed to rest for the sulphur to separate, then decantered, and the clear liquid treated with iron salt; the precipitate being oxidized in the air. The iron solution is added gradually while stirring; and from time to time samples are taken to ascertain whether or not precipitation is complete. This result being obtained, the liquid is left at rest, and then run off clear. The prussian blue is then treated in filter-presses, and transformed into potassium ferrocyanide by the ordinary means.

The second process is based upon the insolubility of the double salt Ca $(NH)_4$ Fe $(CN)_6$. Pure salammoniac is never employed, but matters are so arranged that this salt may be produced in sufficient quantity at the time of precipitation, by endeavouring to obtain lyes containing sufficient ammonia to merely render it necessary to neutralize them with hydrochloric acid. For this purpose it is well to add to the lixiviated material a small quantity of unspent material mixed with lime to supply the requisite ammonia. The operation is performed in an apparatus with an agitator constantly moving. Hydrochloric acid is added until acid reaction takes place, and then all is heated to 80° C. The double salt is separated in the form of a white powder slightly tinged with blue. When precipitation has been effected, the agitator is stopped, and after a rest the clear liquid is run off, and the precipitate removed to the filter-press. The double salt not being perfectly insoluble at 25° C., it is well to precipitate the mother liquor with an iron salt in the state of prussian blue. The double ferrocyanide can then be treated either in an agitator

apparatus (thus giving pure calcium ferrocyanide, subsequently transformed into potassium ferrocyanide), or treated directly with carbonate of potash in the presence of lime.

The third operation is also based upon the formation of a slightly soluble double salt $Ca\ K_2\ Fe\ (CN)_6$. Precipitation can take place either directly on the ferrocyanide solution containing at least 100 grammes of $K_4\ Fe\ (CN)_6$, or on the same solutions condensed to 20° to 25° Baumé. It occurs at a temperature of 80° C. in small agitator boilers. Excess of potassium chloride should be utilized in the form of crystals. The double salt $Ca\ K_2\ Fe\ (CN)_6$ is precipitated in the form of slightly yellowish powder separated by decantation or filtration. The powder having been washed in water, is treated with carbonate of potash to obtain yellow prussiate of potash.

Coming to the subject of the recuperation of the sulphocyanides, the authors show that the water from the first lixiviation, after the distillation of the ammonia, contains calcium sulphocyanide. It can be treated with a soda or potash salt, and sulphocyanide of soda or with potassium obtained by concentration and crystallization, or precipitated with a copper salt, and the sulphocyanide of copper transformed into alkaline sulphocyanide by being treated with the corresponding sulphide. Some gas managers prefer the regeneration of the sulphur before extracting the cyanogen compounds, sulphide of carbon or tar oil being utilized for the purpose; others extract the sulphur by fusion below water in closed boilers, under great pressure. Finally, in a Marseilles works, the sulphur is extracted with superheated steam. The sulphur is always blackened by tarry substances, which render it unsuitable for the market; so that it is not removed to a great extent.

The authors next pass in review the various processes proposed for the extraction of cyanogen compounds from purifying materials. Valentin, by a patent taken out on Nov. 12, 1874, lixiviated the material with water to remove the soluble salts, and treated the residue boiling with carbonate of lime or magnesia, or with a mixture of the two. Thus ferrocyanides of magnesium and calcium are formed which remain in solution and are then precipitated as prussian blue. Harcourt, in 1875, treated the material with sulphuric acid. The sulphates of iron and ammonia are dissolved, and the sulphur and prussian blue remain insoluble. The latter is prepared by the aid of ammonia, and precipitated from the solution with an iron salt. He transformed the sulphocyanides into sulphate of ammonia with sulphuric acid and binoxide of manganese.

Ruheim and Zimmermann, under their German patent of 1883, work as follows: The material, freed from sulphur and soluble substances, is pulverized, screened, and mixed with lime. The mixture is heated in a closed vessel to a temperature of 40° to 100° C.; and the ammonia combined with the ferrocyanide is distilled and collected. The ferrocyanide of calcium solution obtained is treated by the known method for transformation into prussian blue, or evaporated and treated with potassium chloride to form a double cyanide—$Ca\ K_2\ Fe\ (CN)_6$—which is transformed into ferrocyanide of potassium with carbonate of potash. The mixture of material and lime can be lixiviated direct to obtain an ammonia solution of ferrocyanide of calcium, which, if carefully treated hot, in certain conditions, gives a precipitate of ferrocyanide of calcium and of ammonium which is with difficulty dissolved in water. The latter treated in a closed vessel with lime gives pure ferrocyanide of calcium, and the ammonia distils. The calcium ferrocyanide is then transformed into prussian blue or yellow prussiate by the ordinary methods.

The Hempel and Steinberg process (German patent of Nov. 21, 1884) consists in first exhausting the material with hot water at 60° C., and then treating it at the ordinary temperature with a 10 per cent. ammonia solution; the amount being four to five times more than that required for transformation into ferrocyanide of ammonium, which is then made into prussian blue or yellow prussiate. In the Wolfrum process (German patent of Nov. 14, 1886), however, the material is treated with sulphuric acid or dilute hydrochloric acid, and the solution obtained neutralized with iron oxide. The sulphocyanide of ammonium is thus decomposed, as also the ferrocyanide of ammonium, and sulphate of ammonia formed; Berlin blue, sulphur, and ferrohydrocyanic acid being precipitated. Sulphur is extracted with sulphide of carbon in suitable apparatus.

The Donath and Ornstein process (German patent of May 29, 1898) is based upon the property of prussian blue to dissolve in condensed hydrochloric acid, and to be reprecipitated when the solution is evaporated or left in the air. The material is first treated with a very dilute acid, to dissolve the iron oxide, and the residue is dried and dealt with by condensed hydrochloric acid. The prussian blue dissolves, giving the solution a slight yellow tint; and it is precipitated by adding water in the form of crystals or small needles. M. Richter, by his French patent of 1889, heats the material in a closed vessel, into which he conveys a jet of steam; the ammonia liberated being collected in sulphuric acid. The residue is also treated in a closed vessel with hydrochloric acid, to obtain perchloride of iron, and the residue mixed with carbonate of magnesia and lixiviated with water to remove the ferrocyanide of magnesium, which is transformed by ordinary means. Herr Esop ("Zeitschrift für angewandte Chemie," 1889) digests the material in water, and then treats it in filter-presses, and subsequently with lime and sulphate of soda—a mixture which gives better results than lime alone.

Herr Marasse, of Berlin (French patent of Nov. 22, 1883), transforms the ferrocyanides into sulphocyanides. After lixiviating the material with water, it is heated in a closed vessel to a temperature greater than 100° C., and in presence of an excess of lime determined according to the amount of ferrocyanide in the material. Ferrocyanide of calcium is formed, and also sulphide of calcium, which acts on the ferrocyanide, giving sulphocyanide of calcium. According to the patentee, decomposition is complete. The calcium sulphocyanide solution is purified and transformed into ferrocyanide by iron in a divided state. Potash or soda can be employed instead of lime.

Herr Holbling ("Zeitschrift für angewandte Chemie," 1897) proposed a similar method to transform the prussian blue into sulphocyanide of barium by boiling the material several hours in presence of a slight excess of sulphide of barium (5 per cent.) or only half an hour with from 10 to 15 per cent., at a pressure of three atmospheres. The inventor claims complete transformation. After filtration, the sulphocyanide of barium solution is treated with a current of sulphurous acid (or preferably of carbonic acid) to decompose the excess of sulphide of barium, and transform it, in the case of sulphurous acid, into thiosulphate of baryta and sulphur, or into carbonate of baryta in that of carbonic acid. These, being insoluble, are separated by filtration. Mr. Lewis devised the following method: The purifying material being freed from sulphur, it is boiled with milk of lime. The solution obtained, containing ferrocyanide and sulphocyanide of calcium, is treated with sulphurous acid and a ferroso-sulphate solution, which gives prussian blue. This is separated by filtration, and from the solution remaining the sulphocyanides are extracted by means of a copper salt, as for ammoniacal liquor.

Finally, M. Mascow's process, described in his French patent of 1901, is very original. He utilizes the dissolving power of ammonia in presence of alkaline cyanides. The cyanogen compounds are transformed into alkaline cyanides soluble in ammonia, and the other impurities into products insoluble in this liquid. The material is dried, and mixed with sodium, magnesium, aluminium, iron, or zinc, or their oxides or carbonates, mixed with carbon or calcium carbide, or even both. One or other is employed according to the composition of the material. If it is rich in sulphocyanides, the metallic iron, carbon, or the carbonate of potash employed must be mixed. The mixture is then heated away from the air, or in an inert gas, at a temperature which transforms the cyanogen into alkaline cyanide, which is then dissolved in ammonia—the impurities remaining insoluble.

In bringing their articles to a close, the authors say they have indicated the broad lines of the very interesting industry for the extraction of cyanogen compounds from the bye-products of gas manufacture. They consider the present position of the industry quite favourable for an extension of the processes described, more especially those for utilizing the spent purifying material.

THE APPLICATION OF PRODUCER GAS TO INDUSTRY.

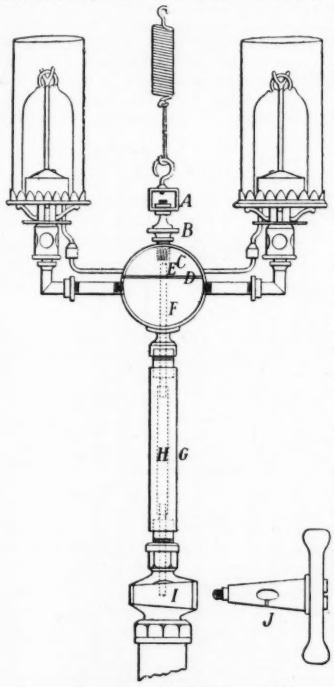
In connection with the London Chamber of Commerce "Higher Commercial Education Scheme," Mr. H. A. Humphrey lectured in the hall of the Drapers' Company last Wednesday on the above subject.

The economical aspect of the question was first touched upon by the lecturer, who said that if producer gas could be generally introduced to replace direct firing by coal in all cases where gas-firing is applicable, the saving in the consumption of fuel would amount to at least one-half of the total quantity now used; and as about 166 million tons of coal are consumed annually in Great Britain, the enormous importance of such an economy to a commercial nation was obvious. In the production of gas for lighting houses and streets, the process was one of distillation only; and some 70 per cent. of the combustible matter contained in the coal remained to be drawn from the retorts in the form of coke. The gas-producer was an apparatus for the conversion of the whole of the combustible matter contained in the coal into a combustible gas; no coke residue being left, so that nothing but ashes, which it was impossible to burn, remained to be drawn from the producer. Essentially the gas-producer was a closed vessel containing a deep bed of incandescent fuel, through which air or air and steam was blown, and in which partial combustion of the coal took place. The amount of coal actually burnt in the producer was, however, the minimum necessary to generate the heat required for decomposing the coal and some of the steam, and converting them into an inflammable gas, containing hydrogen, carbon monoxide, and methane gas as the combustible constituents, and into carbon dioxide and nitrogen as the non-combustible constituents. In retorts for producing illuminating gas, Mr. Humphrey said, a ton of coal yielded 10,000 cubic feet of lighting gas; but from each ton of coal consumed in the gas-producer, about 150,000 cubic feet of producer gas were obtained. Although the calorific value of the lighting gas was nearly four times that of the same volume of producer gas, the quantity of the latter obtainable was so much greater that the total available heat units in the producer gas were practically four times as great as with lighting gas derived from the same weight of fuel.

The Mond producer was described as the latest and most up-to-date system of manufacturing gas suitable for both heating and power purposes, and the first in which ordinary slack was used for producing power gas. Dr. Mond was, the lecturer said, also the first to recover, on any large commercial scale, the ammonia produced in the process—about 90 lbs. of sulphate of ammonia being now recovered for every ton of coal used, representing a value of over 4s. per ton of coal utilized. The importance of the recovery of the bye-products of gas production was emphasized, inasmuch as mainly to this source we must look in the future for the enormous quantities of artificial manure that will be required to renovate the corn-producing areas for the supply of the world's crops. By means of lantern slides, the application of gas to industrial purposes was illustrated. Instances were given of the great saving in fuel which had followed the introduction of gas; and it was pointed out that the advantages of gas-firing were not confined to economy of fuel, for, by the general adoption of the system, the smoke nuisance would be entirely abated, there would be no dust and dirt to contend with, labour would be reduced, repairs to furnaces minimized, temperatures could be regulated with absolute certainty, and more uniform results obtained. Dealing with the application of this form of gas to the production of power by the employment of gas-engines, the lecturer pointed out that in the steam-engines of the present day about nine-tenths of the heat value of the coal is wasted; and in the average engines and boilers only from 5 to 10 per cent. of the original heat units appear in the form of mechanical work done. The gas-engine had already far out-classed the best steam-engine in the question of heat economy; and he thought it could safely be said that the best steam-engines required twice as much coal, and ordinary steam-engines three to five times as much coal, as a gas-engine giving the same output of work. Mr. Humphrey predicted a brilliant future for the modern gas-engine.

IMPROVED INCANDESCENT CLUSTER BURNERS.

Mr. William Hall, of Manchester, whose improvements in gas lighting apparatus have previously been noticed, has designed a burner (of which an illustration is given) that will be found very useful for street-lamps or railway-station platforms, or places where much vibration is experienced. An identical burner to the one shown, fitted with ten burners, has been fixed in a lantern suspended from the station-roof at Blackpool for more than two years, and has given every satisfaction. The consumption of mantles, we are informed, has been very small. Another advantage claimed for the burner is the simple arrangement for pilot lighting. As will be noticed, there is only one cock required. This shuts off the pilot-lights when the burners are in use, and relights them when the gas is shut off from the burners—thus obviating the mantles being covered with carbon, or allowing gas to escape which is not required. The whole thing can be put together very cheaply, as no special fittings are required; and it can be made for any number of burners. It will also be noticed that the unsightliness of tubes hanging from each burner is dispensed with, only a centre tube being required. This can either be made from iron or rubber tubing, as required.



In explanation of the illustration, it may be stated that A is a small brass swivel to allow the burner to swing round without affecting the regulating-screw B, which controls the whole of the pilot-lights, and which is similar to that used in any brass pendant body. The top portion of the pendant body is partitioned off for the use of the pilot-lights. D is a small piece of sheet brass, made gas-tight in C. E is a small piece of $\frac{3}{16}$-inch brass tubing, which passes from the inside of the main cock, and is soldered around immediately it passes through the piece of sheet brass D. F is the chamber for supplying gas to the main burners. G is a piece of $\frac{1}{2}$-inch or $\frac{5}{8}$-inch rubber tubing. H is a piece of $\frac{3}{16}$-inch rubber tubing enclosed inside G. I shows where the $\frac{3}{16}$-inch brass tubing is inserted into the inside of the cock, but not allowed to pass through. J is a small slot cut out of the plug of the main cock to shut on and off the pilot-lights.

REGISTER OF PATENTS.

Furnaces for Gas-Retorts. — Waddell, A., of Dunfermline, and Waddell, F., of Broughty Ferry, N.B. No. 186; Jan. 3, 1902.

This invention relating to retort-furnace arrangements consists (besides the special form of producer illustrated) of a modified lid for the retorts and a hopper—which can easily be adjusted to drop out on the opening of the door and fall back before the door is shut—to guide the fuel into the producer.

Fig. 1 is a front elevation of a retort-setting, the left half of which shows a section of the generator on line E, F, G, H (fig. 3); and that shown in section on the right is a sectional view of the special blocks on the line J, K (fig. 2). Fig. 2 is a section on the line L, M (fig. 1). Fig. 3 shows a section on the line A, B, D (fig. 1). Fig. 4 is a section on the line N, O, T, U (fig. 1).

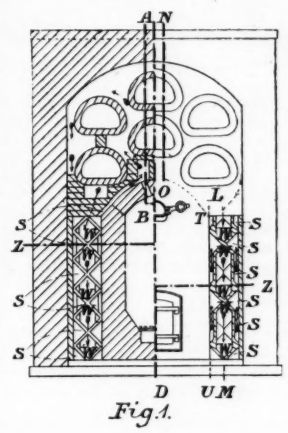


Fig. 1.

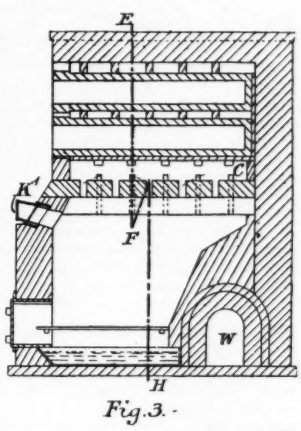


Fig. 3.

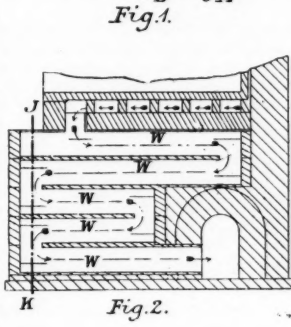


Fig. 2.

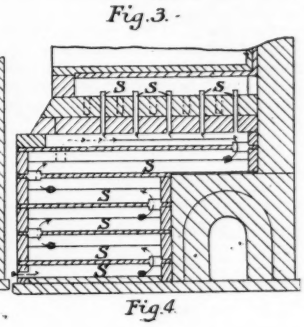


Fig. 4.

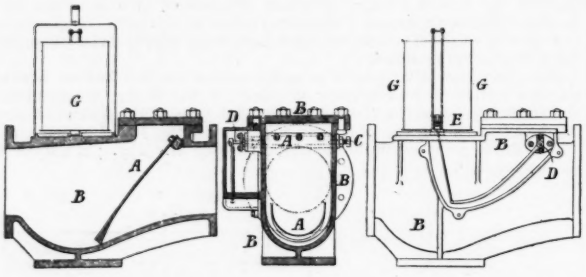
Fig. 1 shows one method of forming the waste-gas passages. W indicates these waste-gas flues and S the secondary air flues. Specially-shaped blocks are used. These are so altered in section at the back and front, and provided with ports W, as to form passages for the waste gas from the higher to the lower flues, and passages for the secondary air from the lower to the higher flues. The section of the flues may be of the form shown, of circular form, or of elliptical, corrugated, helical, or other form which admits of the secondary air being in contact with as much (or nearly as much) of the brickwork surface of the flues as the waste gases are in contact with. Flues may also be formed with helical or inclined corrogations, in order that they may have a greater exposed surface, and that they may give a twisting motion to the waste gases and the secondary air.

Measuring and Recording the Rate of Flow and Quantity of Water Passing through Pipes, &c.—Kennedy, R., of Kilmarnock. No. 711; Jan. 10, 1902.

This invention relates to waste-water meters, in order to provide a more satisfactory and reliable reading on the measuring or recording mechanism used. In such meters as hitherto constructed, according to some arrangements, there is employed an ordinary flap or back-pressure valve of such a size and so carried at its upper edge that, when no water is passing, it rests by its weight on a seat formed for it in a chamber through which the water is to flow, and entirely closes the passage. The measuring mechanism used is actuated from the shaft or spindle on which the flap or valve is carried when the shaft is turned by water passing through the chamber lifting the flap more or less. It has always been found, however, says the patentee, that the flap-valve vibrates considerably, so that the diagram produced on the recording drum is unsteady and unreliable. His invention is designed to overcome this defect in the valve.

In the arrangement shown, the flap or back-pressure valve A is mounted horizontally in the chamber B. One end of the flap at the top is hung on a pin C, and the other end is fitted with a spindle D, working horizontally in a stuffing-box bearing—the flap being arranged to fit the sides of the chamber as closely as possible in all positions. The flap, when in its closed position, is inclined at an angle of about 45°; and on its inner side a part of the surface, extending from about the middle to the bottom edge, is made slightly dished or concave.

The bottom of the chamber B, on the inlet side, is made to slope downwards in curving fashion from the inlet; the exact curve of the slope being varied to suit different cases. With this construction, the direction of flow of the water passing along the pipe communicating with the chamber B is not altered abruptly when it encounters the flap; but the water is directed under the flap without abrupt change of direction at the same time as it exerts the necessary power to lift the flap more or less.

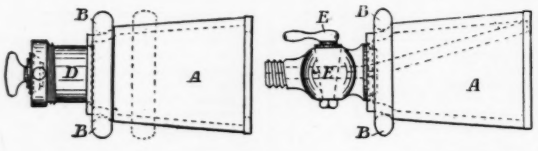


A recording pen or pencil E is arranged to act in contact with a clock-driven drum G mounted vertically on the chamber B. The pencil is attached to a lever fixed to the end spindle D of the flap or valve, so that when the valve moves the pencil traces a diagram of its action on the recording drum. It is found in practice that the close fitting of the inclined flap between the sides of the chamber as described, together with the sloping and curved formation of the bottom of the chamber B, "combine effectively to cause the water to open or close the flap gradually, and without sudden jerks," &c.—thus enabling the pen or pencil to trace a comparatively regular and reliable line on the recording drum.

Plugging Gas and Water Pipes, &c.—Ebdell, T. W., of Doncaster. No. 1604; Jan. 21, 1902.

This invention relates to plugs or stoppers for water, gas, or other pipes, that will automatically tighten within the pipe by the pressure to which they are exposed.

Two forms of the device are shown. In both there is a hollow conical-shaped or tapered plug or body A, of any suitable metal or substance; and encircling the cone are one or more loose rings B of rubber or other flexible or elastic material. At one end of the cone, there is a connection D for temporarily attaching a small pipe to a



larger one, or for any other suitable purpose; or the outlet may be provided with a cock or the like E when used for stopping up water-pipes, so that the water can be run off gradually.

When being used, the apparatus is inserted into the pipe to be stopped; and by drawing the thin end of the cone or body-piece forward, the rubber ring mounts or rides up the cone or body-piece until it is jammed perfectly tight, thereby effectually preventing the passage of gas, water, or the like which may be inside the pipe.

Supplying Illuminating Gas under Pressure.—Lake, H. H.; a communication from the Selas Gesellschaft mit Beschränkter Haftüng, of Berlin. No. 2161; Jan. 27, 1902.

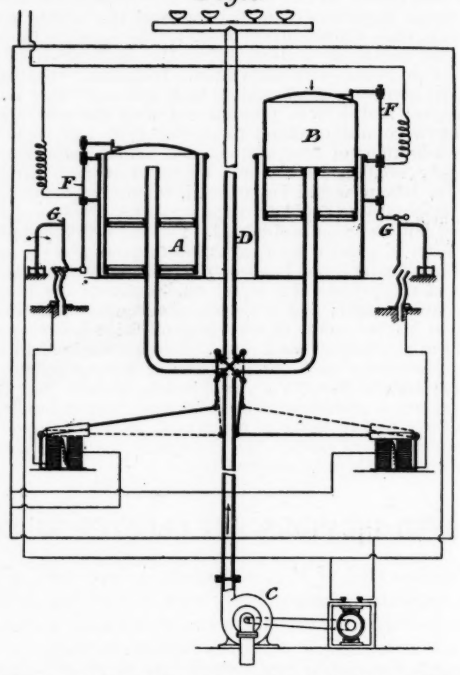
This invention (which was favourably mentioned by Professor Lewes in the course of the third of his recent series of Cantor Lectures, and was also referred to in a paragraph in the "JOURNAL" for Dec. 23, p. 1678) relates to a "method of supplying gas to illuminating bodies by means of pumping or the like devices, which force the gas or gaseous mixture into two or more compressed gasholders; the method being characterized by the fact that one of these holders only supplies gas to the service-pipe when the other holder is cut off from the service-pipe while it is being replenished with gas."

The *raison d'être* of the invention is thus given by the patentees: To obtain an advantageous and economical use of gas in illuminating installations, and to ensure the highest efficiency, it has lately been the custom to utilize mechanically or power-driven forcing devices for introducing the low-pressure gas into pressure-vessels, whence it is distributed to the burners. In lieu of gas, mixtures of gases, or gas and air, may be distributed in this manner, whereby separate means may be provided for producing the mixture. But in installations of this kind operated with reciprocating pumps or the like, it is found that the resulting shocks not only affect the pressure-vessel, but are communicated also to the service-conduit, so that a steady light free from flickering cannot be obtained. These disadvantages are specially apparent in small installations. For this reason, the adoption of similar arrangements as heretofore constructed for the supply of gas or gas mixtures under increased pressure is unsuitable for such small installations.

The chief feature of the invention consists in the fact that the discharge of the gas or gas mixture is effected from several vessels, which alternately discharge into the service-conduit, and then receive a fresh supply. These pressure-vessels and the forcing mechanism operate independently of each other in such a manner that the latter, for the introduction of the gas to the distributing pressure-vessels, is prevented from intercommunicating with the service-conduit. The reversing of the forcing device is so effected that the pressure-vessels which at the moment are discharging the gas, are brought only in actual communication with the forcing device after the completion of the reversing action. At the same time, provision may be made so that the flow of gas in the service-conduit is not interrupted.

The arrangements for effecting this process may be varied in accordance with the special construction of the pressure-vessel and the type

Fig. 1.



of pumping or forcing device employed; but it is essential that the various pressure-vessels and the pumping device operate independently of each other. All the pressure-vessels may be caused to co-operate with a single gas-pump; and the latter may be so arranged as to be rendered idle during the reversing of the pressure-vessels. The delivery of the gas in the pump during the reversing can be effected into a separate vessel or chamber unconnected with the service-conduit, when the pump is continuously operated. If, for example, two or more

Fig. 2.

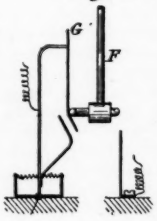


Fig. 3.

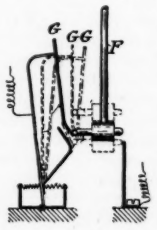


Fig. 4.

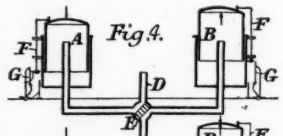


Fig. 5.

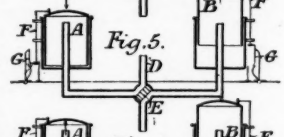


Fig. 6.

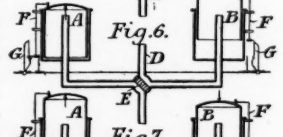


Fig. 7.

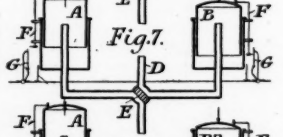


Fig. 8.

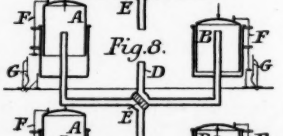
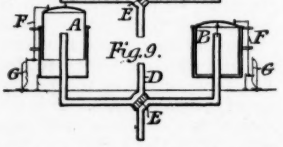


Fig. 9.



pressure-vessels are adopted, the extra vessel or chamber may be a further pressure-vessel. The pump mechanism may be composed of several combined pumps adapted to be started and stopped by the working of the pressure-vessels.

Fig. 1 shows a suitable arrangement for carrying out the process. Figs. 2 and 3 show sliding contacts for starting and stopping the motor or for reversing the distributing member. Figs. 4 to 9 show the operation of the arrangement.

The supply for the pressure-vessels or gasholders A B is obtained from the same pump C which forces the gas, or gas and air mixture, through the pipe alternately into one or other holder; the pump being in this case operated by an electro-motor. Between the supply-pipe and the service-conduit D is a cock E, or other suitable device, adapted to be reversed at the required moment so that each holder is discharged alternately into the service-conduit while the other one—temporarily cut off from the service-conduit—is being charged.

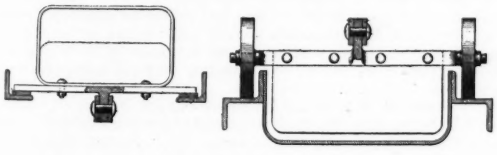
The gasholder-bells carry in guides the rods F fitted at the lower ends with contacts, one of which, through the intervention of a conductor and sliding contact in connection with the electro-motor, produces the starting of the latter, while the other, through the intervention of conductors, electro-magnets, and contact springs, produces the reversion of the cock after the termination of the gas discharge from either holder. In the positions of the bells shown, it is presumed that the bell B is full of gas and ready to discharge into the service-conduit, and that the bell A has just been emptied, so that the reversing of the cock E for the discharge of the bell B and the starting of the motor for the charging of the bell A can be carried out. This reversing of the cock by the closing of the circuit through the contact-piece of the bell A is effected by an electro-magnet, which attracts an armature, and so turns the cock from the position shown in full lines into the dotted position. The bell B can then descend while the re-started pump C fills the bell A. The motor is kept in action until the bell A is filled.

The means for starting and stopping the motor and reversing the cock E may vary. In the arrangement shown in fig. 1, the contact-bar G is carried by an arm normally retained in the vertical position by springs. One surface of the bar is insulated, while the opposite side is conductive. When the bell A rises, the vertically guided contact forces the bar G to the right by sliding along the bent portion until the bell reaches its highest position and interrupts the circuit and stops the motor, while at the same time the bar returns to its vertical position. When in turn the bell B descends, the other contact-bar is first pushed to the right and, at the further sinking of the bell B, is finally released, so that the conductive surface comes into contact with one of the contact-pieces and the spring with the other one.

Figs. 2 and 3 show a slightly modified construction of the contacts, and also indicate the various positions of it. Thus fig. 2 shows the normal position of the bar G, and fig. 3 shows in full lines the position of the bar immediately before the termination of the discharge of a bell. The dotted lines show the position of the parts at the finish of the discharge at the time when effecting the reversing of the cock and the starting of the motor. In the dotted position of the parts, the charging of the gasholder is beginning.

Conveyor and Elevator Chains.—Marsland, J. S., and Slingsby, W., of Halifax. No. 2691; Feb. 3, 1902.

This invention relates to the chains used in conveying or elevating plant, where the chains slide over the trough or gutter of the conveyor or elevator, or are otherwise liable to become worn by frictional contact with the material being moved or with the guides or supports. To effect this, a chain is made having alternate single and double links. Between each pair of side links forming a double link, is inserted a wearing block or blocks of suitable material and of convenient size and

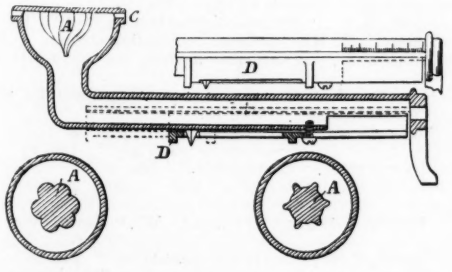


shape. These wearing blocks project beyond the side links in such a manner, and to such a distance, as to prevent the side links, and also the adjoining connecting single links, from coming into contact with the guides or supports. The wearing blocks are maintained in position between the side links by bolts passing through the blocks and through the side links.

The illustration shows the application of the improvements to a bucket elevator, and to a scraper or push-plate conveyor.

Gas Heating-Burners.—Winter, R., of Hanover. No. 18,950; Aug. 28, 1902.

The patentee points out that, in the burners ordinarily employed in gas cooking-stoves, the irregular combustion, and the poor economy of the combustible mixture (as also the tendency to the firing-back of the flame), have their cause, in the majority of cases, either in the



badly proportioned and non-homogeneous mixture of the gas and of the air, or else in the fact that in the delivery of the gaseous mixture freedom and regularity are prevented. With the view of obtaining a heating flame burning in a rational manner, he proposes to allow the delivery from the burner of a very intimate mixture of gas and air, "supplied and composed exactly in accord with the pressure of the gas supply," by directing surfaces for the distribution which are "essentially twisted in the form of a helix or in a similar manner," arranged in the chamber of the burner traversed by the combustible mixture.

There is shown in vertical longitudinal section a form of burner in which intimate mixture of the gas and the air is said to be obtained by the system of mixing by twisted guides in helical forms arranged close to the annular delivery. The form of these surfaces may vary—two different examples being shown.

The cone A, furnished with directing surfaces, and arranged close to the gas-delivery orifices C, is designed to deliver the mixture of air and gas, uniformly distributed and mixed, to the burner; while to obtain the exact mixture of gas and air, the mixing-tube of the burner is surrounded (in whole or in part) by an air-regulator D, in the form of a sliding shutter, which can be fixed in any desired place by a screw. On one side of the mixing-tube can be arranged, in proximity to the extremity of the shutter, a scale to facilitate the regulation of the air entry by the shutter.

Catch-Boxes for Retort-Mouthpieces.—Holt, A. & E., of Rochdale. No. 5052; Feb. 28, 1902.

This invention relates to the catch-boxes formed on the mouthpieces of gas-retorts, to which are pivoted the swing catches for securing the lever of the lid which closes the mouth of the retort. In present practice, the patentees remark, such catch-boxes are cast in one with the retort mouthpiece, and are very liable, under stress of ordinary working conditions, to get broken off or damaged—necessitating the provision of an entirely new mouthpiece. The object of the present invention is to provide auxiliary or independent catch-boxes, with means whereby they can be readily secured to the mouthpiece without letting down the heat, to replace a broken or damaged catch-box.

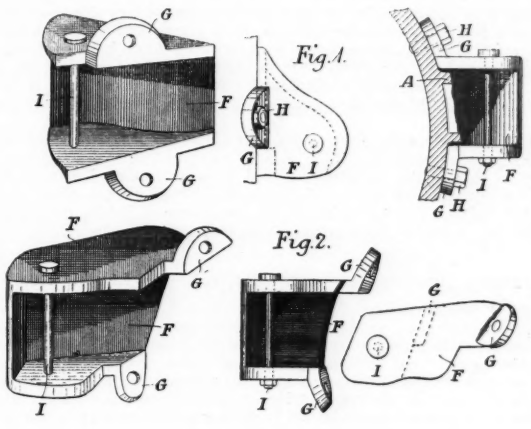


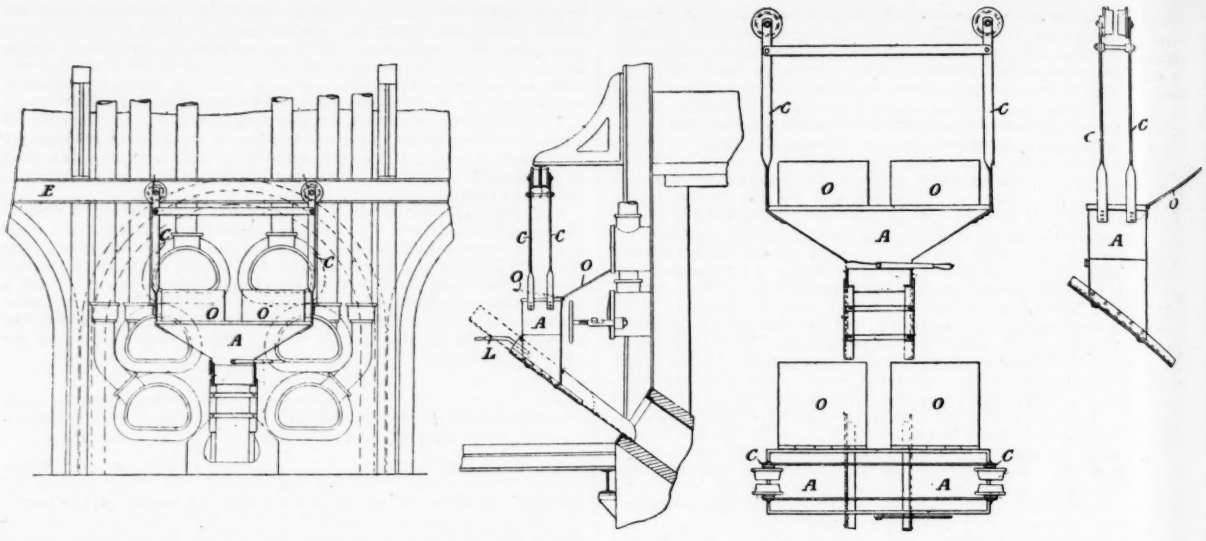
Fig. 1 shows the parts of a catch-box made for application to a horizontal retort; and fig. 2 for an inclined retort.

To replace a broken catch-box, the box F, in size larger than the ordinary catch-box A, so as to clip over or embrace it, is provided. The clip catch-box F is furnished with lugs G, by means of which it can be secured to the mouthpiece with set-screws H. In addition, a pivot-pin I is carried by the box for the usual swing catch. When fitting the clip catch-box, it suffices to tap holes in the mouthpiece for the set-screws H, which can be effected without letting down the heat of the retort, so that the working is only suspended for a comparatively short time.

Charging Gas-Producers used in Combination with Gas-Retorts.—Gibbons, W. P. & G. B. A., of Lower Gornal, Staffs. No. 3997; Feb. 17, 1902.

Hitherto the gas-producers in settings of gas-retorts have (say the patentees) usually been charged with hot coke—as drawn from the retorts when set horizontally, or as falling from the retorts when set at an angle—by a charging-shoot of such a form as to direct the coke to the producer from the centre retorts, where there is a vertical centre tier, or from the right or left hand vertical tier of retorts when there is no centre tier. These charging-shoots are usually carried on wheels attached to the under part of the framing of the charging-shoot, and the charging-shoot is moved on wheels running on rails. By their invention, however, the floor-space usually occupied by the charging-shoot is saved by suspending it from a carriage adapted to run on a girder track or rail track above the shoot and parallel to the bench of retorts.

In the illustrations (p. 228), A is the charging-shoot with an open top and inclined sides, and an outlet mouth at bottom. The shoot is carried at a convenient height (below the retorts) by a carriage formed of four uprights C fixed to the upper part of the charging-shoot; the uprights having at their upper ends axle-pins on which rollers revolve. These run on the bottom flange of the overhead girder-track E, arranged parallel to the retort-bench, and carried by brackets fixed to the buckstaves of the setting; or the girder-track may be carried as by cross girders, which at one end are fixed to the buckstaves and at the other end in the retort-house wall. The uprights C are stayed by cross-bars and stay-bolts. The portion of the charging-shoot which enters the producer-mouth is moveable—being carried in an inclined



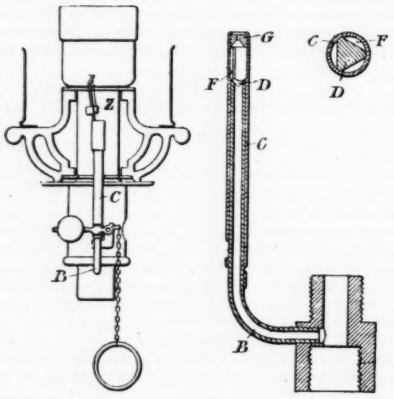
position, and adapted to slide up and down on inclined guides fixed to the sides of the lower part of the shoot, so that the lower portion can be withdrawn from the producer to the position indicated by the dotted lines, where it will be clear of the mouthpieces of the lower retorts while passing them as the combined carriage and shoot are being moved along the track. To facilitate raising the lower part of the shoot, a handle L is fixed to the side of the moveable part, and means may be provided for locking the lower part of the shoot in its highest position—such, for instance, as a lever-handle jointed to the front of the shoot, and arranged to take into a notch in the side of the lower part of the shoot when the latter is in its highest position, and also to take into another similar slot when the lower part is in its lowest position in the charging-mouth, so as to prevent it moving down too far.

Hinged to the side of the upper part of the shoot nearer to the retort there are two plates O, which can be turned so as to rest against the bottom part of the mouthpieces and form an incline for the coke to pass down from the retorts to the shoot. These hinged plates can be folded back on the top of the shoot, as indicated by the dotted lines, when the shoot has been moved along to another producer.

Automatic Gas-Igniter. — Schroeder, O. E. L., of Hamburg. No. 21,746; Oct. 6, 1902.

In an automatic gas-igniter having an igniting pipe branching off from the main pipe, and having its orifice inside the igniting burner closed by a conical valve enclosed on all sides, the patentee proposes to arrange the conical valve inside a tube placed over a vertical igniting pipe, and having its upper orifice completely filled by the igniting burner; the tube being adapted to open the igniting pipe in the usual manner by lifting the conical valve.

The bye-pass or branch-pipe B for the igniting burner branches off from a short length of tube inserted into the main pipe either in front of, or behind, the gas-tap, or, if a three-way cock is used, directly from the cock. The inner edges of the upper orifice of the branch-pipe are conical, and the orifice is normally tightly closed by the conical valve D, which bears on the conical edges. The valve is provided with a



prismatic upward extension; and the edges of the extension are fastened to the inner walls of the tube C. The latter is placed over the branch-pipe B, its upper end being closed by the igniting burner G. The igniting ball Z can also be placed immediately at the end of the tube C; the flattened sides of the upper part of the valve D leaving passages F between the latter and the tube C, through which gas flows from the branch-pipe B to the igniting burner when the valve D has been lifted. The tube C with the valve cone D fixed inside it is lifted by means of a double-armed lever, which is pivoted on an arm fixed to the branch-pipe. One arm of the lever takes into a lateral recess in the tube C, and a chain or the like, freely suspended from the other lever arm, facilitates the lifting if the device is placed in a high position. A weight can be attached to the lever to assist the automatic closing of the branch-pipe.

APPLICATIONS FOR LETTERS PATENT.

197.—Donkin, G., and Rodgerson, W. J., "Generating pressure by the combustion of air and gas or liquid fuel." Jan. 3.
265.—Farkas, A., "Incandescent gas-burners." Jan. 5.
269.—Stumpf, J., "Steam or gas turbines." Jan. 5.
271.—Louet, E. V. E., "Gas or petroleum motor." Jan. 5.
292.—Sutton, C. J., and Rudd, J., "Preventing incandescent mantles from breaking." Jan. 6.
298.—Withington, W. H., "Regulating the pressure of gas. Jan. 6.
301.—Webster, W., "Acetylene generators." Jan. 6.
327.—Sutton, C. J., and Rudd, J., "Connecting flexible metal tubing to incandescent burners." Jan. 6.
338.—Hunt, J. H., "Turning gas-lights on and off." Jan. 6.
342.—Lord, W. T., "Internal combustion engines." Jan. 6.
343-4.—Melhuish, A. G., "Internal combustion engines." Jan. 6.
356.—Stumpf, J., "Steam or gas turbines." Jan. 6.
388.—Crossley, W. J., and Webb, W. le P., "Internal combustion engines." Jan. 7.
449.—Junghans, O., "Producing illuminating effects." Jan. 7.
464.—Dempster, R., and Sons, Ltd., and Broadhead, J. W., "Coke-shoots used in connection with gas-retorts." Jan. 8.
478.—Lanchester, F. W., "Gas and oil motor engines." Jan. 8.
483.—Bode, F., "Automatic swivel cock for gas or water." Jan. 8.
514.—Reid, J., "A new or improved artificial light." Jan. 8.
530.—Milbourne, R. J., "Fastening and releasing the covers of gas-purifiers." Jan. 8.
558.—Wood, R. & J. H., "Incandescent gas-burners." Jan. 9.
566.—Lanchester, F. W., "Gas and oil motor engines." Jan. 9.
605.—Child, J. F., and M'Allister, W., "Rotary pumps, motors. meters, or air blowers." Jan. 9.
609.—Peters, T., "Self-igniting incandescence bodies for gas lighting." Jan. 9.
621.—Brachhausen, G. A., "Gas-burners." Jan. 9.
640.—Evans, W., and Buck, B. H., "Intensifying gas." Jan. 10.
696.—Edgar, W., "Incandescent gas-burners." Jan. 10.
698.—Westwood, W. H., Wright, E. T., and Westwood, W. W. S. "Fastenings of the mouthpiece-lids of gas-retorts." Jan. 10.
730.—Loftus, I. M., and Pidgeon, A. A., "Padlock for gas-meters." Jan. 12.
782.—Clapham, G. H., "Manufacture of gas." Jan. 12.
789.—Parsons, A. E., "Automatic control of gas supplies." Jan. 13.
791.—Lewis, J., and Waddom, T., "Self-intensifying gas-lamps." Jan. 13.
793.—Billington, W. J., and Morris, E. G., "Atmospheric gas-burners." Jan. 13.
824.—Graham, M., "Discharging inclined gas-retorts." Jan. 13.
862.—Thompson, W. P., "Supports for incandescent mantles." A communication from Ahrendt and Co. Jan. 13.
952.—Marx, H. C., "Internal combustion engines." Jan. 14.
959.—Thwaite, B. H., "Internal combustion engines" Jan. 14.
960.—Cutler, S., "Expansion devices for gas-retort stages." Jan. 14.
965.—Howell, H., "Air or gas compressing apparatus for use in incandescent gas lighting." Jan. 14.
971.—Pfeiffer, A., "Charging retorts." Jan. 14.
1090-1.—Clauss, F., "Generating water gas." Jan. 15.
1158.—Pascaud, P., "Carburettor." Jan. 16.
1182 —Boyd, H., "Purifying and cooling producer gases." Jan 17.
1192. - Bishop, J. H., and Turner, G. W., "Gas or other motors." Jan. 17.
1200.—Jones, T. P., "Acetylene generators." Jan. 17.
1225.—Watson, J., "Lighting gas-jets in mills, factories, and the like." Jan. 17.
1234.—Graetz, M., "Incandescent gas-burners." Jan. 17.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Inclined v. Horizontal Retorts.

SIR,—I have carefully noted the remarks contained in Mr. Goodson's letter in this week's "JOURNAL;" and there are one or two points that I feel obliged to correct him upon. To use his own words, "I cannot allow" him to get away from the fact that the existing conditions must be taken into consideration in any comparison. This fact he clearly endeavours to put on one side in his remarks regarding the overhead hoppers and shifts.

With reference to the first point of large overhead hoppers to hold 36 hours' storage, he appears to endeavour to claim this system for inclined retorts, apparently overlooking the fact that they can be equally well applied to horizontal retorts, and, to go further, have been, and are being, applied to the same. I have always advocated as large storage hoppers as possible with horizontal retorts; and it was only the extra expenditure involved on capital account that prevented engineers years ago from introducing continuous storage hoppers. This important fact that they can be equally well applied to both systems, should convince Mr. Goodson that he cannot claim the advantage arising from them for inclined retorts.

Regarding the shift question, if Mr. Goodson will very carefully refer to the remarks contained in my letter in the "JOURNAL" of the 13th inst., he will notice that I assume he is working with two shifts per 24 hours, and that there is an absence of any reference to a 12-hour shift. I quite understand the system upon which he is working, which is no novelty—in fact, we can lay claim to having introduced similar conditions to those Mr. Goodson is working upon at the Blackpool Gas-Works in connection with a complete installation of inclined retorts carried out there by my firm, where they are working as cheaply as at Heckmondwike. It simply means that a portion of the men are only actually engaged on the works (say) 9 hours, and the other portion the full shift. Of course, it is possible for horizontal retorts to be worked under exactly the same conditions; and therefore it is apparent to anyone that the question of shifts must be taken into all calculations. Further, unless Mr. Goodson is prepared to accept the principle that the rate of wages, the duration of shifts, and all conditions must be taken into consideration in any comparison of working results, it is useless arguing the matter more.

Regarding Mr. Goodson's remarks on the maximum and minimum carbonizing costs, there are bound to be certain units of work which are not as advantageous as others. Also, beyond a certain size of gas-works, we arrive at a point where it is no longer possible to obtain the advantage Mr. Goodson now has, in which the same man will perform multitudinous duties. This advantage often arises in small works, but is always absent in large works, where, owing to various circumstances, one man has one special duty allotted to him. If Mr. Goodson had stated the number of his men and their various duties when on maximum and minimum work, this point would have been more apparent.

Mr. Goodson also must not forget the fact that the remark of mine, which he first of all criticized, was made with reference to the working of separate power machines on small installations; the typical case being the working on twelve beds. I am quite prepared to admit that the machines in question would not work as economically on the small make he mentions; and it is for this reason the combined machine has been introduced, which will be able to work on small units as economically as Mr. Goodson does.

I do not understand what Mr. Goodson means by the remark that I have not corrected for difference in rate in wages. This I specially provided for in my comparison in which Bury is assumed to be working with two shifts. Mr. Goodson advances as an argument against his difficulty in securing a large average yield per ton of coal carbonized, that his gasholder capacity is limited. I am afraid that this argument will not be accepted as being altogether satisfactory, but that there are other points in connection with his working which affect this important question, as I have certainly never allowed the difficulty he mentions to interfere with a good average yield of gas per ton of coal carbonized.

As regards Mr. Allan's letter, which appears in the same number of the "JOURNAL," I thank him for the compliments he pays me; but I do not think that his remarks will for one moment settle the question as to which system is the most advantageous, as there are a very considerable number of points to be taken into consideration which Mr. Allan has not mentioned. Again, the latter part of his letter rather discounts his previous remarks, as he does not appear to have treated the question with the seriousness which it deserves.

Manchester, Jan. 23, 1903. JOHN WEST.

A correspondent in the North writes to point out that it would be very interesting if, through the medium of the "JOURNAL," particulars could be given showing what has actually contributed to Mr. Simmonds's success at Bury. He suggests that this would assist many in coming to a decision on the subject at present under discussion in our columns, as a proper basis of comparison (which is absolutely necessary) can only be had from those experienced in the practical working of the two systems of carbonizing coal. Possibly Mr. Simmonds will be good enough, for the benefit of our readers, to reply to the following questions—adding anything he considers necessary to fully explain his answers.

1.—Maximum and minimum number of retorts in use during the year?

2.—Approximate make per ton and per mouthpiece and class of coal used?

3.—Do you find your make per ton more or less than your neighbours using same coal with inclines or hand labour?

4.—Total cost of the installation, including stoking machines complete with hot-coke conveyor and coke-handling plant, but exclusive of cost of coal-stores, retort-house roof, and walls?

5.—Amount paid per ton for interest and depreciation or sinking fund?

6.—Number of years allowed for wiping out cost of installation?

7.—Cost of repairs per ton of coal carbonized?

8.—Approximate maximum and minimum and average wages per ton?

9.—Does cost per ton include all labour for carbonizing, also foremen, mechanics, coal and coke handling, boiler and engine men?

10.—What is the saving in wages per ton with hot-coke conveyors and coke-handling plant, as compared with hand labour?

"A Ray of Light" and Its Electrical Critics.—Mr. T. E. Pye writes to say that he unfortunately made a mistake in the letter on this subject which was published in last week's "JOURNAL." In the fifth paragraph, the words "and to occasionally clean them away for human consumption?" should read "and to occasionally clean them away, than to retain them in the air for human consumption?"

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Friday, Jan. 16.

(*Before the* LORD CHIEF JUSTICE *and Justices* WILLS *and* CHANNELL.)

Ilford District Council and the Gas Company's Mains.

This was a motion to set aside, or to remit back to the Arbitrator, an award made under the Tramways Act, 1870, for the purpose of determining an alleged difference under the Act which had arisen between the Ilford District Council and the Gas Company (*ante*, p. 168).

Mr. C. A. RUSSELL, K.C., and Mr. WHATELY appeared for the Council, who were moving; Lord COLERIDGE, K.C., and Mr. MEYER for the Company.

The LORD CHIEF JUSTICE asked if the objection to the award was that it was not according to the statute.

Mr. RUSSELL said there were several objections to it, the principal one being that the Arbitrator had exceeded his authority, and he should submit that this appeared on the face of the award itself. The facts were shortly these. The Ilford District Council in 1899 obtained an Order, which was duly confirmed by Act of Parliament, under which they became the tramway authority; and in February, 1902, they commenced the construction of their tramways. Ilford was a district which had comparatively recently assumed an urban character. The central portion had now become quite urban; but there was an outer ring, thinly populated, though the population was rapidly increasing. In fact, he believed it held the record for increase of population anywhere in the neighbourhood of London. The particular tramway in question was one described as No. 12, which commenced in the heart of Ilford and ran along Ley Street, and its continuation under various names, for nearly 2¼ miles, to a point known as Cranbrook Road. For the first half-mile the tramway passed along Ley Street, which had houses on each side, many of which had service-pipes connected with the gas-mains, which ran for the whole distance. Beyond the first half-mile, however, there were very few services, and in some parts none at all. On March 21, an application was made to the Company by a Mr. Jefferies for a supply of gas, to which he was entitled, and which the Company were willing to give him; but they alleged that when they came to lay the service-pipe, they encountered an obstruction by reason of the bed of concrete on which the tramway was laid. On March 27, therefore, they served a notice on the District Council, requiring them to alter the position of the whole of the gas-mains in Ley Street, &c., to such an extent, and in such manner, that the tramway should not endanger such mains, or interfere with the supply of gas. The District Council not being prepared to comply with the notice, on April 9 the Company applied to the Board of Trade, under the Tramways Act, to appoint an Arbitrator. Major-General Hutchinson was in due course appointed by the Board; and he heard the matter on June 17 and 18, and made his award on the 25th of that month.

The LORD CHIEF JUSTICE supposed the gas-mains were laid under statutory powers.

Mr. RUSSELL said he assumed so; but whether they were or not, he thought the Company would have the same rights under this Act of Parliament. The award recited the provisions of the Tramway Act, the application by Mr. Jefferies, and that many other cases were daily occurring. It also recited the notice and the refusal of the Council to comply with it, and then said: "I award and adjudge that the gas-mains laid down before the commencement of tramway No. 12 in Ley Street, and the termination of the same tramway in Cranbrook Road, shall be lowered to a sufficient extent to admit of service-pipes between this main and the houses on the side of the tramway remote from the main being laid so as to enable these service-pipes to be laid horizontally under the bottom of the trench in which the electric conduits are placed without having to cut through any concrete which may be used under the bottom of such trench. In those cases where the position of the gas-main is underneath the tramway, or so close to it that access to the gas-main could not be conveniently effected without interfering with the tramway, the gas-main shall be moved laterally to such a distance as to enable such access to be obtained without interference with the concrete trench under the tramway." His first point was that the Arbitrator dealt with something which had reference to service-pipes to be laid in future.

The LORD CHIEF JUSTICE: Present and future. He should say Jefferies' case was a present one.

Mr. RUSSELL said Jefferies was a person whose rights were not asserted until the rights of the tramway authority, whatever they were, had accrued. He submitted that the Arbitrator had no power to make any such order with reference to the future supply of gas. It was stated in evidence by the Company that, in some cases at any rate, the gas main did not run straight from point to point, but wobbled about in rather a curious manner, both laterally and vertically. In some places it lay under the concrete bed of the tramway, and in others only a very short distance from a vertical position under it. Their point was that, if they wanted to get at the main, either to repair it or to insert services, they could only do so by an interference with the concrete bed. It was to this that the latter part of the award was directed; but he should submit that this was entirely outside the powers of the Act.

The LORD CHIEF JUSTICE asked if horizontal service-pipes were essential or only beneficial?

Mr. RUSSELL said there was no doubt a V-shaped pipe was objectionable; but an incline upwards from the main to the house was quite proper. There were well-known means of avoiding the difficulties of V-pipes without laying them horizontal. That was a matter of fact on which the Arbitrator heard evidence. Section 30 of the Act was the material one to consider. "For the purpose of making, forming, laying down, maintaining, repairing, or renewing any of their tramways, the promoters may from time to time, where and as far as it is necessary, or may appear expedient, for the purpose of preventing frequent interruption of the traffic by repairs or works in connection with the same, alter the position of any mains or pipes for the supply of gas or water, or any tube, wires, or apparatus for telegraphic or other purposes, subject to the provisions of this Act, and also subject to the following restrictions." The first part of the section dealt with what the tramway authority might do for its own convenience; and it seemed to him that it was a mistaken reference to that, that the Arbitrator had made the latter part of his award. In the first sub-section, the other point of view, if he might say so, was taken; and certain rights were given to the gas or other companies. It said: "Before laying down a tramway in a road in which any mains or pipes, tubes, wires, or apparatus may be laid" (and he should ask the Court to hold that this meant mains, pipes, &c., that were in fact there when the tramway was proposed to be made), "the promoters shall, whether they contemplate altering the position of any such mains, &c., or not, give seven days notice to the company or person to whom such mains, &c., belong, or by whom they are controlled, of their intention to lay down or alter the tramway, and shall at the same time deliver a plan and section of the proposed work." [That was done in this case.] "If it should appear to any such company or persons that the construction of the tramway, as proposed, would endanger any such main or pipe, &c., or interfere with or impede the supply of water or gas, &c., such company or person may give notice to the promoters to lower or otherwise alter the position of the said mains, &c., in such manner as may be considered necessary." It was under this portion of the section that the notice recited in the award was given by the Gas Company. The rest of the section provided that, if any difference arose as to the necessity for such alteration, it should be settled in the manner provided, and for all alterations being made with as little inconvenience and detriment as possible. Now, with regard to the portion of the tram-line which ran through the urban part of Ilford, no doubt there were existing service-pipes which might have been interfered with, and some evidence of that sort was given by the Gas Company; but the order made went far beyond anything which existed at the time of laying down the tramway.

The LORD CHIEF JUSTICE asked if there was evidence how far the main went with service-pipes connected to it, and how far without?

Mr. RUSSELL said for rather over half-a-mile there were service-pipes; beyond that there were very few. The whole main was there when the laying of the tramway commenced; but a very considerable portion of it was laid when the notice was given.

The LORD CHIEF JUSTICE: You only began the construction in February, and the notice was given on March 27.

Mr. RUSSELL said at that time the line was laid beyond Mr. Jefferies' house.

Monday, Jan. 19.

On the resumption of the proceedings this morning,

Mr. RUSSELL continued his argument, and commented further on section 30 of the Tramways Act. He contended that the intention of the Act was only to deal with what was in existence, though it gave a gas company the right to object before any work was done. In this case, the Company attempted to object, not only with respect to the part of the road in which the tramway was not constructed at the time of the notice, but also with respect to the part already completed. The District Council came to the conclusion that they could construct the tramway without endangering or interfering with the gas-mains.

The LORD CHIEF JUSTICE said a gas-main was of no use, ordinarily speaking, unless it could have service-pipes attached to it.

Mr. RUSSELL said there was ample provision that everything belonging to the Gas Company at the time should be amply protected from damage, and that they should have no additional expense cast upon them, because they were bound to alter the position of the mains. There was a provision that they should not be interfered with until substituted pipes and valves had been provided, so that there should be no interruption of the supply.

The LORD CHIEF JUSTICE said if the Company went to the tramway authority and said: "We have a main all along this road, but at present there is not a single service-pipe in it. Your tramway is going along the road, and very soon there will be people who will want gas; but we shall not be able to supply them." That would seem to be a case in which the construction of the tramway would interfere with the supply of gas from that main.

Mr. RUSSELL then read section 32 of the Act, which provided that nothing in the Act should take away or abridge any power already possessed to open streets or roads along which any tramway was laid; sub-section 3 provided that no compensation should be payable to the tramway authority for any injury caused by such opening of the roads, or for any loss of traffic thereby occasioned; and another sub-section provided that any additional expense incurred by the Gas Company by reason of the existence of the tramway in any road where such mains were laid before should be borne by the tramway authority. The Company complained that the bed of concrete on which the tram-lines lay had been interposed between their main and possible future customers, and that it would take longer, and cost more, to cut through this than if the road had been left in its original condition. He suggested that such additional cost was by the Act thrown on the tramway authority, and that it was not a case of endangering the main, or preventing a supply of gas. Undoubtedly it would be more expensive to get at the main in certain places; but that was just the case provided for by section 32. He only knew of one reported case which he thought had any bearing on this point, and that was where a tramway was carried over a railway by a bridge, which the railway company had to keep in repair. In order to do so, they had to remove the tramway; and having done it, the tramway company called on them to replace it. The railway company, however, said they were the road authority under section 32, and they had a right to repair the road, and had no liability to reinstate the tramway; and the Court held that they were right. (The case referred to was *Wolverhampton Tramway Company v. Great Western Railway Company*, 56 L.T.). It seemed to him that the same thing would happen here. The Gas Company could interfere with the tramway to get at the main, under section 32, and would not be liable for any expense caused by the existence of the tramway. He submitted that the second part of the order, requiring a lateral moving of the main, was wrong, because it did not purport to be founded on any view of danger to the mains, or interference with the supply of gas. It was contended before the Arbitrator that all that was necessary to found his jurisdiction was to show that in future the gas-main would be less convenient where it now was, and that it could not be got at without inconvenience to the tramway. But that was not the view taken by the District Council—at any rate, they were prepared to take the risk. His contention was that the Arbitrator's jurisdiction only arose in certain circumstances, which were pointed to in section 30. If the Arbitrator had found there would be interference with the supply of gas, that would be one thing. But as he read the award, it indicated the view that there would be interference, not with the supply of gas, but with the structure of the tramway. The only complaint made as to any interference with the supply through the existing service-pipes had reference to the first half-mile—viz., it was said that concrete had been put round a service-pipe, and that this would tend to increase the deposit of naphthalene, and so choke the pipe and interfere with the supply. Then, with regard to the other branch of the case, it was said they would be getting fresh customers along the road, and when they had to supply them they would have, in some cases at any rate, to cut through the bed of concrete; but that was exactly what was provided for by section 32. The whole difficulty arose from the gas-main being laid at a very shallow depth—13 inches to 2 feet below the surface. There was no law compelling the Gas Company to lay it deeper; and, of course, the tramway authority must make the best of it. But he submitted it was not right to say that the tramway could only be constructed on the terms of lowering the gas-main the whole way with a view to the future development of the business of the Gas Company. Section 30 dealt with the supply of gas through existing mains and pipes, and started by giving to the tramway authority power to alter the position of the mains if they thought fit. The only way in which any right was given to the Gas Company to have the position altered was by way of restriction on the power of the tramway authority. He submitted that the Arbitrator had no power under the Act to make the award he had, and that it should be remitted to him.

Without calling on respondent's Counsel, their Lordships proceeded to deliver judgment.

The LORD CHIEF JUSTICE: I have listened with the greatest attention to the argument of Mr. Russell, which seems to me to put in various forms the main objection that he takes to this award—namely, that it is bad, because it purported to order the lowering of a main with reference to the future supply of gas. I will deal with the second paragraph of the award when I have dealt with the main duty of the Arbitrator under the section. It seems to me that, when this Act is considered, the Arbitrator undoubtedly had jurisdiction to entertain the question which he did entertain, and to make the award which he has made. We have not the least right, even if we had any materials, to criticize the way in which he has ordered the work to be carried out, assuming that it was within his jurisdiction. The statute, by section 30, begins, as Mr. Russell has pointed out, by giving the tramway authority a power of lowering the pipes. Of course, anyone who has any knowledge of these Acts, knows that persons going to construct important works, which will interfere with other important works, are not meant to be, and never are made, judges in their own cases; and, although the section gives power to the tramway authority to lower mains and pipes, the general power and the operative part of the section is contained in clause 1 and the following sub-sections. By section 1 it is provided: "That before laying down a tramway in a road in which any mains or pipes may be laid, the promoters shall, whether they contemplate altering the position of any such mains or pipes or not, give seven days' notice to the company, persons, or person to whom such mains or pipes may belong, or by whom they are controlled, of their intention to lay down or alter the tramway, and shall at the same time deliver a plan and section of the proposed work." That is not for the purpose of showing exactly what they are going to do, but what they propose to do, in order that the parties may be in a position to ask, if they think fit, for arbitration. "If it should appear to any such gas company or gas person"—I read that in, of course—"that the construction of the tramway as proposed would endanger any such main or pipe, or interfere with or impede the supply of water or gas, such company or person (as the case may be) may give notice to the promoters to lower or otherwise alter the position of the said mains or pipes in such manner as may be considered necessary." That, of course, means considered necessary by the person making the demand. Again, they

are not to be the judges in their own case; "and any difference as to the necessity of any such lowering or alteration shall be settled in manner provided by this Act for the settlement of differences." Then, in section 32, the rights of persons who have statutory powers to open roads are preserved with reference to future pipes or mains or tubes; but they are to exercise their powers under certain restrictions with regard to notice, with regard to the payment of damage, and with regard to possibly some determination of differences in that case. Section 33 provides for the appointment of an Arbitrator by the Board of Trade. It is to my mind perfectly plain that, in deciding what he will order to be done when a difference has arisen under section 30, the Arbitrator will not disregard, and ought not to disregard, the powers and rights that are given to both parties under section 32. But it does not in any way show that he has no power to order what he has ordered in this case—to point out that the Gas Company have certain rights reserved to them with regard to breaking up and opening roads, and that they must exercise those rights in the future under the provisions of section 32. The question, and the only question, is, Had the Arbitrator jurisdiction to make this award under section 32? Without going through the whole award, and only remembering that the Arbitrator who made it is a gentleman of considerable experience in such matters, what he does is—so far as it is material to be mentioned—to recite the demand of the Gas Company. Accordingly, shortly before the operative part of the award, he recites that "the Gas Company have given notice to the Ilford Urban District Council to lower or otherwise alter the position of the mains and service-pipes along the whole of Ley Street, Horns Road, Tanners Lane, and to the end of the tramway route at Barkingside, to such extent, and in such manner, as will not endanger any such main or pipe, or interfere with, or impede, the supply of gas." Therefore, the Arbitrator has perfectly plainly kept in view what his duties and responsibilities are under the Act. He has to be satisfied that there is a case for the mains being endangered, or the supply of gas from the mains being interfered with. I quite agree with Mr. Russell's argument, that this section relates to existing mains; but when you get an existing main in a street, what is a main there for? It is not there to bottle up gas which will remain in it for ever; it is for the purpose of supply. How is gas supplied? Of course, the argument has shown—what I hope we knew before—that it is to be supplied by means of service-pipes, and those service-pipes have to be put into the main, in order to get the gas out of it. It appears—at any rate, it is a matter which the Arbitrator may consider—that it is desirable that these service-pipes shall run horizontally, which is desirable in the interests of the people who are going to have the gas. Remembering that there is an existing main, and that this is to be used for the supply of gas, the Arbitrato· has to consider whether the construction of the concrete platform—this massive construction, extending not over the whole of the road, but over parts of the road in a great many cases—may endanger the pipes and interfere with the supply. In view of this interference, what has he awarded? He has awarded that the gas-mains at certain points "shall be lowered to a sufficient extent to admit of service-pipes between the main and the houses on the side of the tramway remote from the main being laid so as to enable these service-pipes to be carried horizontally under the bottom of the trench in which the electric conduits are placed without having to cut through any concrete which may be used under the bottom of such trench." The Arbitrator obviously considered that it was a desirable thing that the service-pipes should be horizontal; and, accordingly, when he deals with the question of what is to be the alteration, so that the supply of gas may not be interfered with, he says that you are to lower the existing main so that service-pipes from it may run horizontally without having to cut through the concrete. So stated, how can it be possible to suggest that that is not an award which deals with the question of the tramway, if constructed, and the pipes unaltered leading to an interference with the supply of gas? It is very difficult indeed to imagine. It is obvious that, with the pipes there and the tramway there, you ought to have the pipes at a certain depth so that the supply of gas may not be interfered with; in order that, instead of having to dip down your service-pipe underneath the concrete bed, you may be able to run it horizontally. It is the construction of the tramway which necessitates that, and that would be, if unaltered, an interference with the supply. The next matter that he awards is that: "In those cases where the position of the gas-main is underneath the tramway, or so close to it that access to the main could not be conveniently effected without interference with the tramway, the gas-main shall be moved laterally to such a distance as to enable such access to be obtained without interference with the concrete trench under the tramway." I have already pointed out that he is not only dealing with the question of interference, but he is dealing with the question of endangering. Gas-pipes have to be repaired, they have to be tapped, and they have to be got at. Here is a solid, very massive construction; and the Arbitrator says, in the exercise of his judgment, that, for the safety of the pipes and for the convenience of them—that is to say, for the convenience of the supply of gas—you are not to leave the gas-main underneath this concrete construction, or so close to it that you cannot properly get at the gas-main. Again, I have no doubt that the award was perfectly right on the merits; but that is not for us. How we can possibly say that it is not an exercise of his jurisdiction under this section I have really for a long time been unable to discover; and to say that this jurisdiction is cut down by the latter section, which preserves to the Gas Company the right to open roads with protection given to the tramway authority, which *ex hypothesi* would already be there, is to my mind to lose sight of the fundamental principles that should be borne in mind in construing Acts of Parliament of this kind. I am of opinion that as soon as the section and the award is read, Major-General Hutchinson not only had jurisdiction, but has awarded in accordance with the Act of Parliament.

Justices WILLS and CHANNELL concurred.

The Power-Gas Corporation have appointed Mr. W. G. Turnbull, of 144, St. Vincent Street, Glasgow, as their agent for Scotland. Mr. Turnbull is well known in the iron and steel trades.

AN EDINBURGH GAS EXPLOSION.

Failure to Fix Liability.

In the Second Division of the Court of Session on Wednesday last, the Judges gave their decision in an appeal by the defenders from the Sheriff Court in Edinburgh in an action by Alexander Breck, of Dundas Street, Edinburgh, against Messrs. Tod Bros., flour millers, of Stockbridge, Edinburgh, and also against Messrs. William Stewart and Co., machinery merchants, of Bonnington, Leith, for damages arising under circumstances fully reported in the "JOURNAL" at the time. The pursuer was tenant under Messrs. Tod of a baker's shop which was situated between the flour mill in Stockbridge and the street. A gas-engine in the mill, immediately behind the shop, had been sold to Messrs. Stewart and Co., who sent men, on July 16, 1901, to remove it. In the course of the work, a violent explosion of gas occurred, which caused the death of six men—five of Messrs. Stewart's and the foreman in Messrs. Tod's mill. The shop was wrecked. In this action, the pursuer averred that the explosion was due to fault on the part of the defenders' workmen; and he sued both defenders jointly for £80 as the amount of loss he had sustained by damage to his stock and fittings. Sheriff-Substitute Maconochie found that the explosion was the result of fault on the part of one of Messrs. Stewart's workmen, in uncoupling a joint upon the inlet-pipe; and he gave decree against Messrs. Stewart for the sum sued for, with expenses. Messrs. Tod were assoilzied. The Second Division reversed the decision, and gave both defenders absolvitor, with expenses.

The Lord Justice-Clerk (Sir John Macdonald) said the case was a most unfortunate one in every aspect of it. Messrs. Stewart bought a gas-engine from Messrs. Tod, which they no longer required at their works; and men were sent to take it away. In order to do this, it was necessary that they should detach the gas-engine from the meter, so that it might be removed. But what actually happened, as was proved by the evidence, was that, not only was it detached from the meter, but the meter itself was detached from the main by using a chisel to remove the screw which fastened it, with the result that there was a violent rush of gas into the small chamber where the gas-engine was placed, and that it caught fire from a lantern—all the men who were there, including Messrs. Tod's foreman, being killed. Therefore, all who could speak to the more crucial facts were dead; and anything they could get at, as regarded blame, was entirely by inference. It was clear that Messrs. Stewart's men had no occasion to take off the screw, because their only purpose was to take away the engine, and the attachment of the engine was from the other side of the meter, and had nothing to do with the screw at all. Therefore there was no presumption whatever that they had anything to do with it. As to Messrs. Tod's foreman, it was quite certain that he sent, shortly before the accident, to get a big screw-spanner. There was nothing there requiring to be done with it, unless it was to be applied to one of the screws at the meter; and accordingly they were left practically in the dark, and were unable to say whether it was anybody in the employment of Messrs. Stewart or anybody in the employment of Messrs. Tod who caused the accident. He thought, therefore, there was an entire absence of evidence to lead to any distinctive conclusion on the matter at all. The pursuer, of course, had the burden of proving his case; and if he could not prove fault against anyone in particular, he could not get a decision in his favour establishing that anybody in particular was to blame. Accordingly, unfortunate though it might be—for certainly there was fault on the part of someone—the pursuer was unable to establish who was the person who committed the fault, and therefore to bring home the consequences of the fault to the master of the person who committed it. He was afraid there was no other course but that there should be absolvitor.

Lord Moncreiff said there was no doubt that the explosion was caused by the coupling on the inlet-pipe between the meter and the main being recklessly and intentionally loosened, thus causing a large and fatal escape of gas. This intentional loosening of the coupling must have been done by one or more of the six men who were in the engine-room where the explosion took place. Unfortunately, all were killed, and there was no direct evidence as to which of them opened the pipe. The evidence, therefore, was purely circumstantial. He thought that such evidence might have been sufficient if it could have been shown with reasonable certainty whether the inlet-pipe was opened by one of Messrs. Stewart's men or by the other man. At first sight, the presumption seemed to point to Messrs. Stewart's men. They were all skilled workmen, and had come there for the purpose of removing the engine; whereas Messrs Tod's foreman had nothing to do except to point out the engine that was to be taken away. On the other hand, Messrs. Stewart's men had nothing to do with the pipe that was opened. It was not part of what they had bought; and it was extremely unlikely that, in the presence of the mill foreman, their workmen would have attempted, for their own purposes, to remove it. But if there had been nothing in the evidence as to the foreman's actions except that he went to the engine-room to point out the engine to Messrs. Stewart's men, and to see that a partition was properly taken down, there might have been sufficient evidence to support the finding of the Sheriff-Substitute that the fault lay with Messrs. Stewart's men; and the question being a Jury one, he would not have been disposed to alter the Sheriff's decision. There was, however, some evidence which he thought the Sheriff had overlooked—not enough, indeed, to fix the foreman with fault, but sufficient to raise serious doubt. After the pipe connecting the meter and the engine had been disconnected, the foreman took into the mill a shifting key used for the purpose of unscrewing nuts. No doubt the key was too small for the ring of the inlet-pipe; but it might have been tried, and, on being found to be too small, a chisel might have been used to loosen the ring. This might have ultimately caused the explosion. Now, this was evidence that the foreman was not merely a passive spectator, but was interfering and assisting to a certain extent—for what purpose they could only surmise. Perhaps it was to disconnect the meter, which was no longer required by his employers. He might have used the

chisel himself, or he might have got one of Messrs. Stewart's workmen to do it. In this state of the evidence, he could not affirm with whom the fault lay. The conclusion of the Sheriff-Substitute might be the true one; but the Sheriff had not, he thought, given due weight to the evidence implicating the foreman, to which he had referred. The result was that the action failed as against both sets of defenders.

Lord Young and Lord Trayner concurred.

Conviction for Stealing Gas.

At the County of London Sessions last Thursday, before Mr. M'Connell, K.C., Thomas Hudson, a bicycle repairer, of Bishop's Road, Bethnal Green, surrendered to his bail, and pleaded guilty to stealing 12,400 cubic feet of gas belonging to the Gaslight and Coke Company (*ante*, p. 108). Mr. Travers Humphreys, who prosecuted, said that, in connection with his business, prisoner had a workshop in which he used a forge for brazing, &c. With a view of ascertaining whether the meter was working accurately on his premises, one of the Company's fitters paid a surprise visit on the 24th of December last. He then discovered an ingenious method of stealing the gas for working the forge. The process was one in the highest degree dangerous both to the operator and to any person living in or visiting the house. From the service-pipe Hudson had removed the main tap. One side of this he stopped with a wooden plug, and to the other he attached an india-rubber pipe. This ran hidden under the boards to the forge, and so enabled Hudson to use the Company's gas without it being registered. Counsel pointed out that the serious part of the offence was not its dishonesty, but the incalculable results which would have followed any fumbling on the prisoner's part. If he had been overcome, the gas would have escaped unchecked, because he had removed the tap which controlled it. Rapidly filling the house, the gas would have prevented the approach of anyone; and the only way to stop it would be by opening the road and gaining access to the main. Detective-Inspector Nicholls proved that in June, 1896, Hudson was convicted of receiving stolen property. The prisoner was sentenced to twelve months' hard labour.

Wrongful Removal of a Gas-Engine on Hire.

An application was last Wednesday made to his Honour Judge Roberts at the Walsall County Court by Mr. Cave to review the committal order for contempt of Court against Mr. Axon, the Birmingham representative of Messrs. Crossley Bros. The facts of the case were stated briefly in the last issue of the "JOURNAL" (p. 168). Mr. Cave said that since the order was made, the respondent had been seriously ill; and he was unable to attend the Court in consequence. He had, however, considered his position, and desired to make the most complete submission to the Court in respect of the acts which he had committed. The gas-engine which he removed had been taken back to the premises of the bankrupt to whom it had been hired; and it had been refixed to the satisfaction of the Trustee. The costs of the Official Receiver had also been paid; and everything which his Honour ordered had been done. The respondent now desired to offer a most complete apology to the Court for his offence; and his employers desired to associate themselves with the expression of regret. What they said was that the instructions they gave to the respondent were given in ignorance of the receiving order; and they had no idea that the engine would be removed from the Official Receiver's possession. Judge Roberts said that it was clear that the consequences of the order had been to make the respondent seriously unwell, and that there was no subterfuge. Respondent and his employers having submitted themselves unreservedly to the Court, he was able to come to the conclusion that the respondent had purged his contempt sufficiently for him (the Judge) to direct that the order for committal should be remitted.

Claim for a Water-Meter Damaged by Fire.

In the Leicester County Court last Tuesday, before His Honour Judge Wightman Wood, the Leicester Corporation brought an action against Amos Booth for £2 17s. 3d., the value of a water-meter which was damaged by fire on Sept. 14, 1901. Mr. Simpson, on behalf of the plaintiffs, said the claim was for a water-meter supplied to defendant on his premises, for the care and custody of which he was responsible by an agreement he entered into with the Corporation. The meter was practically destroyed by fire; and on Sept. 13 last, when the Corporation were pressing him for the debt, he addressed to Mr. F. Griffith, the Water Engineer, a letter in which he said that, seeing his loss in connection with the fire was £1000, the major portion of which arose from the fact that the fire brigade, though so promptly on the spot, could not, through the neglect of the Water Committee, get a sufficient supply of water, the Corporation should send him a cheque for at the very least £500, instead of asking him to pay for the meter. Defendant, after he had seen the agreement, admitted he had entered into the contract. His Honour: Under the agreement, you are liable for the meter if it is destroyed. It has been destroyed, and they want you to pay for it. Defendant said his attention was not called to the agreement in any shape or form. His Honour replied that this was unnecessary. He could read it, or, if he could not, he should have got someone else to do so for him. Defendant: There is not one person in ten thousand who would read it. His Honour: That is because they are foolish and imprudent. People should not sign anything without reading it. Defendant said that his property would not have been destroyed if there had been a proper supply of water. His Honour remarked that defendant might have a claim against the Corporation, but he had not filed it; and the Corporation ought to have five days' notice of it. Defendant did not suggest they had caused the fire in any way? Defendant: Oh, no; but I suggest they did not extinguish it as they ought to have done. His Honour said he understood he was defending this case because he desired to call attention to it. Defendant: Yes. His Honour: Well, you have had about ten minutes in which to do it. Now I must find against you.

MISCELLANEOUS NEWS.

LONDON COUNTY COUNCIL AND SUNDAY GAS TESTING.

Sir George Livesey's "Open Letter."

At the Meeting of the London County Council last Tuesday—Sir J. M'Dougall in the chair—the presentation of the report of the Public Control Committee afforded Mr. Shrubsall, who represents Norwood, an opportunity of asking the Chairman if he had seen the letter of the Chairman of the South Metropolitan Gas Company with reference to gas testing on Sundays (*ante*, p. 168), and especially what he proposed to do with regard to the attack on the ex-Chairman of the Committee. Mr. W. J. Squires (the Chairman of the Committee), in reply, said he thought his best course was to state that the letter referred to only reached members on the previous Saturday night. The Committee had not met; but it was his intention to bring the letter before them. Until this was done, he did not think anything should be discussed in the Council. As to the reference in the letter to the ex-Chairman of the Committee, Mr. Johnson himself should be the gentleman to make any statement in regard thereto. Mr. W. C. Johnson said, with the permission of the Council, he should like to make a brief reference to the personal attack made upon him by Sir George Livesey and circulated among his colleagues. The Chairman pointed out that this did not arise upon the report of the Committee. Mr. Johnson submitted that it would be a little difficult for him to make a statement at any time without the permission of the Council; but he thought, after the question put by Mr. Shrubsall and replied to by the Chairman of the Committee, the Council might allow him to make a personal explanation. The Chairman said the honourable member was entitled to make a personal explanation; but the point was whether it was advisable that it should be made then. It was a question whether it would not be better to leave the personal explanation until honourable councillors had seen the letter, upon which the Committee had not yet reported. Mr. Johnson said that, under the circumstances, he would defer his explanation. The report was received.

Mr. Johnson's Reply.

In deference to the suggestion of the Chairman, Mr. Johnson postponed replying to Sir George's Livesey's letter. He has, however, made the following statement in regard to the matter in the course of an interview with a representative of the "JOURNAL."

I should like to say first that I regret very much that Sir George Livesey should have taken any of my remarks as a personal attack upon himself. I am sure they were not intended (or, indeed, are easily construed) as such. I have the very highest opinion of Sir George, and of the work he has done as the pioneer of cheap gas in London; and with much of the latter part of his letter I am in sympathy. I have every knowledge of the question, having been for one year the Chairman, and twice Vice-Chairman, of the Public Control Committee. During my chairmanship last year, on a question that arose with regard to the supply of governed burners by his Company, as necessitated by their Act, under which they reduced the candle power, I conducted a personal negotiation with him, which has resulted satisfactorily both to the Council and to the gas consumers. He met us most fairly in the matter, and expressed the hope, in which I agreed, that for the future the relations between the Council and his Company would be improved and run on smoother lines.

I do not propose to go through the ten numbered misstatements that he has accused me of making in my speech in the Council on the 18th of November last, because, with the exception of those which he explains at length in his letter, I cannot understand how he classes them as errors. But I will deal with three matters on which he dwells. I must point out that Sir George has misquoted the original letter of his own Company to the Council dated the 12th of December, 1902, and has also misquoted and misrepresented my speeches of the 18th of November and 16th of December.

He first endeavours to fasten upon me the remarks of Mr. Ward, to which he and the "JOURNAL OF GAS LIGHTING" have taken such strong exception, "that if the Council allowed it to go forth that . . . no tests would be made on Sundays, they (the Gas Companies) would have a royal day for cheating." He even goes so far as to refer to them as "an above-quoted statement" of mine. The only reference I have made to Mr. Ward's speech was that the "JOURNAL OF GAS LIGHTING" referred to it as "the graceless behaviour of the man Ward." Sir George takes this as leading to the conclusion that I "agreed with Mr. Ward." I need hardly point out that this is an audacious inference utterly unjustified by the colourless reference I made to his speech.

Sir George Livesey states that "the County Council have probably forgotten that in 1890 a precisely similar case to the recent one of the Commercial Gas Company was decided in the Council's favour by Mr. Bushby, the Police Magistrate. The Gaslight and Coke Company contended that, for the purpose of taking an average, Saturday and Monday were not successive days. The Council contended that they were, and that Parliament intended Sunday to be *dies non*. The Magistrate took time to consider his judgment, and gave it for the Council, and inflicted a fine on the Company. The Council succeeded then; and, notwithstanding Mr. Johnson's statement that they 'could not succeed' in the recent Commercial case, they would, had they gone on, in all probability have been again successful." Sir George omits to state that, subsequent to Mr. Bushby's decision, it was pointed out by the late Chief Gas Examiner that the "gas testing day" as defined by the Act had been wrongly interpreted, and this fact materially modified the decision of the Magistrate. It is therefore hardly fair for him to quote that case as if it were the latest exposition of the law on the subject. It is he, not I, who has "forgotten."

Then Sir George is very emphatic on my "erroneous use of the word 'poisoned' in the sentence"—that it was not a question of ascertaining the candle power of the gas on Sunday, but "whether or not the people of London were to be poisoned on that day." Sir George says that sulphur is not poison. The latest edition of the "Encyclopædia Britannica," in its article on "Poisons," states that "the gas given off by burning sulphur is most suffocating and irritating. Its inhalation, even in a highly diluted state, may cause speedy death." It also includes in its list of poisons ammonia gas and sulphuretted hydrogen, for the presence of which the Council also test the gas. The word "poison," in the ordinary acceptation of the term, does not necessarily infer a fatal result; and if Sir George will refer to the definition of the word in the "Century Dictionary," he will find my use of it amply justified.

Sir George appears to think that because the Council closely watches the Companies, it fears that he personally and his co-Directors wish to cheat the public. May I point out to him that the obligation to do this is imposed on it by Parliament; and though Sir George apparently wishes the Council to neglect its duty, it will continue to carry it out strictly according to the law.

As the whole matter is now *sub judice*, I do not feel that it would be wise on my part to go into the broader aspects of the question as raised by him. The law will soon be authoritatively declared, and to that the Council and Sir George must bow. But I do hope he will not again attack me as the spokesman of the Committee in the personal manner in which he has recently done. On this question we can agree to differ, and still retain our respect for one another.

Finally, I much prefer co-operation to friction; but we cannot surrender points vital to the protection of the public.

COMING OF AGE OF MR. W. R. GLOVER.

A banquet to celebrate the coming of age of Mr. William Reid Glover, eldest son of Mr. Richard Thomas Glover, Chairman of the firm of Glover and Main, Limited, was held in the Grand Saloon of the Alexandra Palace on Saturday. Mr. Richard Glover occupied the chair; and about 600 guests, staff, and employees, were present.

After the toast of "The King" had been honoured, Mr. John George Glover proposed the toast of the evening—that of Mr. William Reid Glover. He congratulated his nephew on attaining his majority, and felt that it must be the earnest wish of everyone present that Mr. William would have a long, happy, and prosperous life. He had watched his nephew's progress, and could safely say that he had, by his courtesy and kindness, won the esteem and regard of everyone with whom he had come in contact. Mr. John Glover then briefly reviewed the history of the firm since its establishment in 1844, and remarked that the interests of the men had always been the first consideration of his father, Mr. Thomas Glover, the founder. It was also the first consideration of his brother, their worthy Chairman, whose hospitality they were all enjoying that evening; and he sincerely hoped it would always be that of their successors. Some day, Mr. William Glover would take his father's place; and he could not wish anything better than that he would follow in his father's footsteps. He trusted that the kindly feeling which had always existed in the past between masters and men would continue unbroken in the future; and that everyone would work with zeal for the prosperity of the firm.

Mr. Pute, on behalf of the employees, Mr. Glover Clark on behalf of the combined staff, and Mr. Vaughan, on behalf of the Birmingham employees, then presented Mr. William Glover with two illuminated addresses, a gold watch and chain, a case containing a brace of silver-plated army revolvers, and a silver cigarette case.

Mr. William Glover, on rising to respond, had an enthusiastic and musical reception. He said he was deeply touched by the hearty manner in which the toast of his health had been responded to; and he thanked every one most cordially for the handsome gifts which had been presented to him. His uncle had said some flattering things about him, which he felt he did not deserve. But it would always be his earnest endeavour to follow in the steps of his father and uncle; and, if he did that, he felt sure he would do well. At present he was at the office in St. John Street; but he hoped now that he had attained his majority to be able to see and know more about the men whose interests he would always have at heart. He again thanked all for their kindness that evening, and said he would ever treasure the gifts which had been made to him.

The toast of "The Firm" having been proposed, Mr. T. M'Kinnon Wood responded. In replying to the toast of his health, the Chairman said that it had given him very great pleasure to welcome those present that evening. He thanked them all for the kind way they had responded to the toast of his health and that of his son; and he was extremely obliged to the stewards (Mr. Glover Clark and Mr. Thomas Glover) for their able assistance that evening. During the evening, a selection of songs, &c., was given by some of the employees and others. The most interesting item on the programme was a song entitled "Sixty Years Ago in Old Clerkenwell," which was specially written and composed for the occasion by Mr. F. T. Kennard, a member of the staff, whose rendering of it elicited much applause. "Auld Lang Syne" brought a most enjoyable evening to a close.

A New Well for the Windsor Water-Works.—The Windsor Town Council have adopted a report of the Water Committee which recommends that an additional well should be sunk at the water-works on Tangier Island, at a cost of £1100. The well will have a diameter of 20 feet. It is nine years since the last well was sunk; and since then the revenue has increased from £6856 to £8322. Under these circumstances, it has become urgently necessary to find a further supply of water. Several members expressed the fear that the sinking of another well would prejudicially affect the existing ones.

QUALITY OF LEICESTER GAS.

An Interview with Mr. Colson.

The question of the quality of the gas supplied at Leicester has for some time been a subject of discussion in the town; and it has led, as in other cases, to the matter being taken up by one of the local papers. The usual "interview" was the result; and it afforded Mr. Alfred Colson, the Gas and Electric Lighting Engineer to the Corporation, an opportunity of enlightening his visitor, and through him the townspeople generally, on certain points in connection with the consumption of gas which they do not appear to have fully comprehended. He first of all staggered the interviewer by telling him that the illuminating power of the gas was more under the control of the consumers than in the hands of the manufacturers; and, in answer to his surprised look, he proceeded to explain why. In a few simple sentences, he showed that while it is possible, in a specially constructed room, built on scientific principles, with no ray of outside light penetrating, to get 16 or 18 candle power gas by using particular burners and instruments, no such power is obtainable in ordinary everyday working, because those conditions do not exist. Mr. Colson emphasized the point that it rests entirely with the consumer to get the most or the least out of the gas supplied to him; and he supported his remarks by an extract from the first of the recent series of Cantor Lectures delivered by Professor Lewes at the Society of Arts. He showed, by the table given on that occasion, that anything in the way of lighting power—from 0·59 up to 30 or even 35 candle units—can be obtained per cubic foot of 16-candle gas consumed, according to the burner employed. Leaving out of consideration the extreme figures, a consumer can, by changing his No. 5 flat-flame for an ordinary incandescent burner, get an increase from 2 up to 14 candles per cubic foot, whereas it would cost nearly £140 per week to increase the illuminating power of Leicester gas by one candle, and the effect would be inappreciable. The extra outlay, therefore, would be simply wasted. They might, as Mr. Colson put it, just as well "throw the money into the Atlantic." He gave the interviewer some information as to what Parliament has been doing in the matter of lowering the illuminating power of gas, and told him how with 8 candle gas Magdeburg is the best-lighted city in the world, simply on account of the use of proper scientific burners. "Why is it," asked Mr. Colson, in bringing the interview to a close, "that people are frequently complaining of the illuminating power of the gas, and saying that years ago they had no such complaints to make? I will tell you. It is simply for this reason: Years ago there was nothing but the ordinary flat-flame burner in general use; but the advent and use of the incandescent gas-burner has so increased the lighting power of the gas supplied, and raised the standard of comparison, that consumers still using old-fashioned burners are inclined to think that the fault of a poor light is with the gas supply and not with the burner used. The difficulty arises absolutely from the standard of comparison being raised. This is the top and bottom of the whole thing. Complaints will continue to be made until the obsolete burners have been replaced by the more scientific incandescent burners. This is the only cure; and it is a cure that is in the hands of the consumers, and not in the hands of the Gas Committee." Mr. Colson is determined that the consumers shall not lose sight of this fact, for he has had the report of the interview reprinted, with Professor Lewes's table and an extract from his lecture, accompanied by some remarks of his own, and distributed among them. If they do not avail themselves of the means at their command, they will only have themselves to blame.

FATAL ACCIDENT AT THE PLYMOUTH GAS-WORKS.

A young man named Alfred Mills died at the South Devon and East Cornwall Hospital, Plymouth, on Thursday evening last from scalds which he sustained that day at the gas-works, where he was employed as a labourer. An inquest was held on Friday by the Deputy-Coroner (Mr. John Graves). From the evidence then given by Charles Henry Colmer, one of the foremen at the works, it appeared that he and deceased and a boy named Bignell were at work in the sulphate of ammonia department. Bignell had taken up two planks which formed part of the cover of a liquor well, when he was called by Colmer to assist him in transferring crystals to a washing tank. Before he went away, Bignell told Mills to be careful not to fall into the well, as it was uncovered and the liquor was hot. A few minutes afterwards, Colmer and Bignell heard screams; and on going to see what was the matter, met deceased, whose clothing was wet and steaming. He said he had fallen into the liquor well, and forgot that he had been cautioned as to its being uncovered. His injuries were dressed, and he was taken to the hospital; but he was in a state of collapse, and gradually sank and died. Mr. Percy S. Hoyte, the Engineer and Manager of the works, explained that the liquor well, which was 5 ft. long by 2 ft. wide and 3 ft. deep, was built flush with the brick floor. Usually the liquor was cold; and the fact that it was hot on this occasion was due to the leakage of one of the joints of a steam-pipe which ran by the side of the tank. The pipe was in good order on Wednesday, and the fact that there was an escape was not ascertained until after the accident. Bignell, in his evidence, said that he did not remember the liquor getting hot before, and beyond cautioning the deceased and another lad to be careful, he had no time to call attention to the liquor before the accident happened. A verdict of "Accidental death" was returned.

Shepshed District Council and the Gas-Works.—At a special meeting held last week, the Shepshed Urban District Council confirmed the resolution passed at the ratepayers' meeting (*ante*, p. 110) to purchase the local gas-works.

ST. HELENS GAS-WORKS MANAGEMENT.

Increase in Mr. Glover's Salary.

A Special Meeting of the St. Helens Town Council was held on Wednesday—under the presidency of the MAYOR (Mr. Dixon-Nuttall)—to consider the recommendation of the Gas Committee to increase the salary of the Gas Engineer (Mr. Samuel Glover) from £600 to £800 per annum.

Alderman T. COOK (the Chairman of the Gas Committee) moved that the increase be made, on Mr. Glover undertaking to remain at St. Helens for five years. He explained that Mr. Glover had been offered a starting salary of £750 a year to become Manager of the Reading Gas Company; and he thought it would be a calamity for St. Helens to lose his services. Mr. Glover was a man of exceptional ability; and though the increase of £200 was large, it only represented $\frac{1}{8}$d. per 1000 cubic feet of gas. Against this, the Committee were able only eight months ago to reduce the price of gas 3d. per 1000 cubic feet.

Mr. W. L. SHAW seconded the motion.

Alderman COOK, in reply to a question, said Mr. Glover had expressed his willingness to extend his undertaking to seven years if the Council desired it; and, after pressure, the Chairman of the Gas Committee consented to include this in his motion.

Mr. H. H. PEEL opposed the proposal, mainly on the ground that it would mean an increase all round in officials' salaries.

Alderman MASSEY said he would not vote for the proposal, but would not move an amendment. He believed if this increase were granted it would result in a demand for increases from all the other chief officials of the Corporation.

After considerable discussion, the Committee's recommendation was carried with only four dissentients.

BURSLEM CORPORATION GAS SUPPLY.

The Charge for Gas.

The Gas Committee of the Burslem Corporation have lately been considering the subject of the charge for gas; and the revised scale determined upon by them was submitted to the Town Council at a recent meeting. The Committee found that the extra cost of the supply of gas through slot meters amounted to £1050 per annum, made up as follows: Ten per cent. depreciation on 4000 slot meters valued at £2500, £250; additional cost of collection, £200; and rental, at 3s. each per annum, £600. The annual consumption of gas through these meters was estimated at 40 million cubic feet; and a charge of 6d. per 1000 feet on this quantity would produce £1000. The Committee proposed that the cost of street lighting should be charged against the general district fund, and it was estimated that the increased income would admit of a reduction of 4d. per 1000 feet in the price of gas. The present charges are 3s. less 2d., with discounts of 3d. for 50,000 cubic feet and upwards, and 4d. for 100,000 cubic feet and upwards. For consumers using gas-engines, the charge is 3s. less 6d. discount; for those using slot meters, 3s. 4d. less 1d. discount. The Committee propose to charge 2s. 8d., less 2d. discount, for ordinary consumers; 2s. 6d., less 2d. discount, for gas-engines; and 3s. 4d., inclusive of meter-rent, less 4d. discount, for slot meters. They suggested that the charges for meters and cookers should be re-imposed.

Mr. WADE, in moving the adoption of the Committee's minutes, read a letter from the Chairman (Mr. E. Leigh), asking him to tell the Council that he was thoroughly convinced that the new policy, which he hoped would be sanctioned, was, in every respect, the wisest and best course that could be adopted in the interests of the gas undertaking, as well as of the gas consumers and ratepayers. Mr. Wade said the Committee wished to point out that there had been an additional capital charge on the gas-works of approximately £40,000, and that this had not been followed by an increase in the consumption of gas. The Committee were thus face to face with the problem that they had a large extra expenditure which had not proved remunerative, or only to a limited extent. The high price charged for gas had caused a serious decrease in the consumption of that commodity. After careful consideration, the Committee decided to try a policy of supplying free cookers. This resulted in an extraordinary demand for them, without a corresponding increase in consumption. They found that many persons had what proved to be a passing desire for the possession of a cooker, and after a short time had used it very little. So the Committee decided to review the whole position; and they now submitted a scheme which they considered would tend to further development, and result in largely increased profits. They some time ago decided to have a preferential charge. This was found to cause great friction in the town; and it was thoroughly misunderstood by the ratepayers generally. It did not benefit the large consumer in the proportion in which it was thought at the time it would do. Free meters were tried—the rents being remitted. The meter-rent for a small consumer was a substantial sum per 1000 cubic feet, but for a large consumer it was only a fraction of a penny; and though there was a proposal that large consumers should have a certain benefit, the remission of the meter-rents wholly counterbalanced this. The Committee therefore proposed that they should do away altogether with the preferential rate, and have one price for ordinary consumers, and that they should re-impose the charges for meters. Coming to the question of street lighting, Mr. Wade observed that the Committee had for some time past lighted the town free of charge out of the profits. They wished to point out that this was unjust in its incidence. The town lighting ought to be a common charge upon the district rate. It was for the general convenience of all; and it was a very inequitable thing to make the gas consumers pay for the whole of

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 218.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	12⅞—13⅞	..	5 11 1
200,000	5	Nov. 13	6⅜	Bombay, Ltd.	5⅞—6⅛	..	5 4 0
40,000	5	,,	6⅜	Do. New, £4 paid	4⅛—4⅜	..	5 9 5
380,000	Stk.	Aug. 14	12	Brentford Consolidated	247—252	..	4 15 3
270,000	,,	,,	9	Do. New	182—187	..	4 16 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	136—141	..	3 10 11
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	110—113	..	3 10 10
220,000	Stk.	Sept. 11	10	Brighton & Hove Orig.	209—214	..	5 0 4
246,320	,,	,,	7	Do. A. Ord. Stk.	155—160	..	4 16 11
460,000	20	Sept. 26	10	British	39½—40½	..	4 18 9
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c.	—	..	—
82,850	10	,,	9	Do. 7 p.c.	—	..	—
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10⅛—10⅜	..	6 10 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
150,000	20	July 11	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 15	12½	Commercial Old Stock	—	..	—
251,875	,,	,,	9½	Do. New do.	—	..	—
271,875	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	—	..	—
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	132—137	−1	5 16 10
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Aug. 28	2⅛	Crystal Palace Ord. 5 p.c.	117—122	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
106,158	,,	Jan. 15	5	Do. 5 p.c. Deb. Stk.	137—140*	..	3 11 5
486,090	10	July 30	10½	European, Ltd.	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13⅝—14½	..	5 8 8
15,243,200	Stk.	Aug. 14	4⅛	Gas-light and Coke	4 p.c. Ord.	88—90	+2	4 17 9
2,600,000	,,	,,	3½		3½ p.c. max.	87—89	+1	3 18 8
3,799,735	,,	,,	4		4 p.c. Con. Pref.	109—111	−1	3 12 1
4,193,975	,,	Dec. 11	3		3 p.c. Con. Deb.	92—94	..	3 3 10
232,500	Stk	Sept. 11	5	Hastings & St. L. 3½ p.c.		90—95	..	5 5 3
70,000	10	Oct 20	8	Hongkong & China, Ltd.		14⅜—15⅜	..	5 3 3
3,800,000	Stk.	Nov. 13	10	Imperial Continental		206—209	+1	4 15 8
473,600	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.		99—101	..	3 9 4
158,2 2	Stk.	Aug. 21	6	Lea Bridge Ord. 5 p.c.		115—120	..	5 0 0
561,000	Stk.	Aug. 28	10	Liverpool United A		224—226	..	4 8 6
718,100	,,	,,	7	Do. do. B		165—167	..	4 3 10
306,083	,,	Dec. 31	4	Do. do. Deb. Stk.		114—116	..	3 9 0
75,000	5	Dec. 11	5	Malta & Medn., Ltd.		4—4½	..	5 11 1
560,000	100	Oct. 1	5	Met. of Melbourne	5 p.c. Deb.	105—109	+1	4 11 9
250,000	100	,,	4½		4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	Nov. 13	2½	Monte Video, Ltd.		9⅜—10⅜	+½	6 13 4
1,515,892	Stk.	Aug 8	4½	Newc'tle & G'tesh'd Con.		104½—105½	+½	4 5 4
346,855	Stk.	Jan. 2	3½	Do. 3½ p.c. Deb.		97—98	..	3 11 5
300,000	Stk.	Nov. 27	8	Oriental, Ltd.		14⅜—14⅝	..	5 8 1
60,000	5	Sept. 26	7	Ottoman, Ltd.		6⅞—7	..	5 0 0
					* Ex. div.		
105,005	Stk.	Jan. 15	6⅜	Ply'mth & St'house 5 p.c		123—128*	..	4 15 9
851,070	10	Oct. 15	7	River Plate Ord.		10⅜—11	+⅛	6 7 3
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.		92—94		4 5 1
250,000	10	Sept. 26	8	San Paulo, Ltd.		11⅛—12⅛	..	6 8 0
135,000	Stk.	Sept. 11	10	Sheffield A		236—238	..	4 4 0
209,984	,,	,,	10	Do. B		233—235	..	4 5 1
523,498	,,	,,	10	Do. C		233—235	..	4 5 1
103,235	Stk.	Sept. 26	5	Shrewsbury Ord. 5 p.c.		113—116	..	4 6 2
6,000,000	Stk.	Aug. 14	5⅜	South Met., 4 p.c. Ord.		122—124	.	4 6 0
1,700,000	,,	Jan. 15	3	Do. 3 p.c. Deb.		91—93*	.	3 4 6
380,940	Stk.	Nov. 13	5	Southampton Ord.		103—107	..	4 13 6
87,950	,,	Jan. 15	4	Do. 4 p.c. Deb.		100—103*	..	3 17 8
120,000	Stk.	Aug. 28	6	Tottenham and Edmonton	A. 5 p.c.	118—123	..	4 17 7
300,520	,,	,,	4½		B. 3½ p.c.	93—96	..	4 13 9
182,380	10	Dec. 30	5	Tuscan, Ltd.		8½—9½	..	5 5 3
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		94—96	..	5 4 2
230,000	5	Aug. 14	9½	West Ham, 10 p.c.		—	..	—
172,000	10	,,	6⅜	Do. 7 p.c.		—	..	—
				WATER COMPANIES.			
780,662	Stk.	Dec. 30	11½	Chelsea, Ord.		315—325	..	3 10 9
150,000	,,	,,	5	Do. 5 p.c. Pref.		150—155	..	3 4 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75		138—143	..	3 2 11
175,785	,,	Sept. 26	4½	Do. 4½ p.c. Deb.		140—145	..	3 2 1
1,720,560	Stk.	Oct. 15	8	East London, Ord.		228—233	−2	3 8 9
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb.		142—147	..	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb.		97—99	..	3 0 7
700,000	50	Dec. 11	8	Grand Junction	10 p.c. max.	115—120	..	3 6 8
310,000	Stk.	Sept. 26	4		4 p.c. Deb.	125—130	..	3 1 7
708,000	Stk.	Aug. 14	14	Kent		305—315	..	4 8 11
160,000	,,	,,	7	Do. New, 7 p.c. max.		200—210	..	3 6 8
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max.		305—315	..	3 9 10
406,200	100	,,	8½	Do. 7½ p.c. max.		220—230	..	3 13 11
350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb.		125—130	..	3 1 7
500,000	100	Aug. 14	12⅝	New River, New Shares		395—405	..	3 3 2
1,000,000	Stk.	July 30	4	Do. 4 p.c. Deb.		125—130	..	3 1 7
902,300	Stk.	Dec. 11	7	South-wark and Vauxhall	Ord.	207—212	−1	3 6 0
126 500	100	,,	7		7½ p.c. max.	200—210	..	3 6 8
489,200	Stk.	,,	5		5 p.c. Pref.	151—154	..	3 4 11
1,019,585	,,	Oct. 15	4		4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 11	10	West Middlesex		295—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb.		140—145	..	3 2 1
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb.		97—99	..	3 0 7
					* Ex. div.		

† Next dividend will be at this rate.

the lighting. The rateable value of the gas consumers amounted to £26,697—nearly one-fifth of the whole—and some business concerns that were growing rich out of the town escaped the cost of street lighting, which amounted, in some cases, to a free gift from the gas consumers of £50 or £60 a year. What was the outcome of this policy? It had added 4d. per 1000 cubic feet on the price of gas, and resulted in a high charge which had checked the consumption, hindered development, and caused a large number of non-consumers to reap the benefit. The Gas Committee therefore desired the Council to pay for the street lighting. They also proposed to revise the charges. Dealing first with gas engines, Mr. Wade pointed out that the capacity of the works must be equal to the maximum demand, which was only for a few months in the year; and they had the whole works going slackly during certain months. The Gas Committee desired to equalize and regulate the consumption, and secure a steady sale. They believed that if gas were supplied at a low rate for engines, this would increase the demand, and help to regulate the sale during the year. Coming to the question of slot meters, Mr. Wade said it had always proved a rather difficult one. These meters were for the use of those who found it convenient to pay in small amounts—the artisan and the labourer. The Committee at once admitted that they had no right to make extra profit out of the limitations of income of any of their customers. But the gas-works could not, as a business undertaking, afford to be generous to any particular class of consumer. The Committee were confronted with one or two considerations. First of all, there was the increased capital charge for the slot meters over and above the ordinary meters, which amounted to at least £2500. To purchase 4000 slot meters, would take £2500 more than to purchase 4000 ordinary meters; and so the Committee took it that it was only a reasonable thing to charge 10 per cent. depreciation upon them. Then they also had to take into account the fact that they had four persons engaged in collecting money from the slot meters; and it was necessary that there should be as frequent collections as possible. It cost at least an extra £200 per annum for this work. The Committee had therefore to propose that 9d. be charged for a slot meter, as against 6d. for an ordinary meter. These meters were expensive to maintain; the bill for locks alone coming to quite an astounding amount. Therefore 9d. was the lowest figure they could charge. The charge of 3s. per 1000 cubic feet for slot meters was founded on a strictly equitable basis. Speaking of the ordinary consumer, Mr. Wade pointed out that the Committee proposed that the price should be 2s. 8d., less 2d. This was a low, but a perfectly safe, price; and they believed it would result in a largely increased demand, and bring a good return for their extra capital expenditure,

The proposals of the Committee were adopted.

During the past week, the Southport Gas Department supplied about 5000 of the new burners they have selected, as mentioned last week, as suitable for the consumption of their low-power gas.

FATALITIES FROM GAS POISONING.

A Flueless Gas-Stove and Dangerous Fittings.

At the Marylebone Coroner's Court last Tuesday, Mr. Walter Schröder held an inquiry into the death of Mr. Quintin Hogg, aged 57, merchant, Founder and President of the Regent Street Polytechnic Institute, who at eleven o'clock on the previous Saturday morning, was found lying dead in a bath in the bath-room at the Institute. Mr. Douglas M'Garel Hogg, barrister-at-law, said he was the son of the deceased, who, after dining at home on Friday night, went to the Polytechnic Institute, where, in a room he had there, he slept as often as he did at home. He had enjoyed fairly good health. He was of a cheerful disposition, and had no trouble of which the witness was aware. Other evidence showed that Mr. Hogg was seen on Friday night in the vestibule of the Institute, bidding the members "Good night" as they left. He remained on the premises, and was last seen alive at midnight by the caretaker. The next morning between ten and eleven Phœbe Wilson, housemaid at 10, Stratford Place, the family residence, went to the Institute as usual to clean Mr. Hogg's room, when she missed him. Entering the bath-room, she discovered him lying apparently lifeless on his back in the bath. Mr. Herbert Atkins, private secretary to deceased, stated that the bath was quite full, and that water was running from the geyser, which supplied it and a washstand. A gas-stove was kept alight all night. The atmosphere was very close. The only ventilator was a skylight. Dr. Sidney Ringer, the medical attendant to the deceased, stated that on his arrival at the Institute Mr. Hogg had probably been dead several hours. Dr. F. W. Spurgin said he had made a post-mortem examination, which showed that death was caused by asphyxia following the inhalation of carbonic oxide produced by the combustion of gas. The geyser, which the witness had examined, was in good condition; but the gas-stove was without a ventilating shaft, and the fumes from this alone would account for Mr. Hogg's death. The Jury returned a verdict of "Death by misadventure," and expressed sympathy with the widow and family.

Last Tuesday evening, Mr. G. P. Wyatt held an inquest at the Lambeth Coroner's Court on the bodies of Lilian Grace Phyllis Ranger, aged eight years, and Francis Herbert Sidney Ranger, aged nine years, the children of Francis John Ranger, a stonemason, living in Camden Hill Road, Upper Norwood, who lost their lives through an escape of gas at that address. Elizabeth Ranger, the mother, identified the bodies, and said that both children were in good health when they went to bed just before eleven on Saturday night. About half-past eight o'clock the following morning, she went to call them, and discovered them both in an unconscious condition, and the room full of gas. Her husband threw open the windows and went for a doctor, who, upon arriving, pronounced the girl dead. Artificial respiration was performed upon the boy; but he never recovered consciousness, and died shortly after four o'clock on Monday morning. The escape of

PARKINSON'S

CROWN

COOKERS.

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

gas took place from a water-slide chandelier which hung in the centre of the room. She heard the gas passing through the water as she entered. She did not think the children had interfered with the chandelier, which had not been used more than two hours since they had been in the house until the previous week. The husband of the witness said there was a little water in the slide. The chandelier had no globes, and a pound weight was tied to it to balance it. It was pulled a little way down when he entered. The taps were not turned on. Dr. G. D. Parker stated that the girl had been dead for several hours when he arrived. Every effort was made to restore the boy, but without success. The cause of his death was coma following the inhalation of coal gas. In the case of the girl, death was due to asphyxia from the same cause. The Jury returned verdicts of "Accidental death."

On Wednesday week, a Mr. and Mrs. Moroney engaged a room at the Clarence Hotel, Dublin; and as nothing was seen of them the following morning or afternoon, and the door was found to be locked, an entrance was effected to the room by means of the window, when the man was found to be unconscious and the woman dead. There was a strong smell of gas, and the tap was turned on. It is supposed that, through ignorance, the unfortunate couple blew out the light, instead of turning the gas off.

MUNICIPAL TRADING.

At the Monthly Dinner of the London Chamber of Commerce last Wednesday evening—Lord AVEBURY, the Vice-President, in the chair—a discussion took place on the question of municipal trading.

The CHAIRMAN, in introducing the subject, said that the objections he had to municipalities engaging in trade did not result from mistrust of municipal institutions or opposition to them. He fully recognized the ability possessed by members of these bodies. At the same time, it did not follow that they had the special knowledge required to conduct manufacturing and business undertakings to a successful issue. Moreover, they could not give that close personal attention to details which was necessary if business was to be carried on profitably. Another reason was the fact that municipal councillors changed so frequently. The London County Council had been going on for only thirteen years; but so overwhelming was the work that, of the whole of the 140 original councillors, only 29 were still members. These new principles were now urged in the name of "Progress;" but they were entirely contrary to the old traditions of the Liberal party—to the teaching of Cobden and Bright, of Mill and Fawcett. He did not doubt that in some cases profits had been made. When a municipality had had a monopoly, and been able to charge what it pleased, it was easy, of course, to show a profit on paper. No one, it seemed to him, who had read the masterly letters which "The Times" had published on the subject could doubt that, with perhaps the exception of gas, the result had been a heavy loss to the community. If municipalities persisted in embarking on commercial undertakings, they would, he was persuaded, increase the rates, check the progress of scientific discovery, and stifle, if not destroy, that spirit of private enterprise to which in the past our commercial supremacy was mainly due.

Lord MONKSWELL admitted that there really was something in the objection that the members of municipal bodies had no time to undertake the duties of what was called municipal trading; but he contended that the course of events had shown that the London County Council had not neglected any of their administrative duties. He did not agree that the Council possessed no special knowledge. They had good men of business as members. It might be desirable, in some cases, that work should be undertaken by municipalities even where there was a chance of a loss being made. This, however, only applied to monopolies affecting the necessaries of life. He quite agreed that there was a danger in having too many municipal employees who were also electors. While believing in treating them fairly, and even generously, he should condemn any attempt to exploit the ratepayers for their special benefit.

Mr. J. S. FLETCHER, as a member of the London County Council, criticized the management of the Works Department, and said that if a capable firm of contractors had been given the work of the Council, he believed the ratepayers would have been saved £100,000.

Sir W. TOMLINSON, M.P., thought there were undoubtedly public services, such as water supply, which should be in the hands of the municipalities; but the latter ought to be very careful about handling matters which, in his opinion, could be more economically dealt with by contractors and private parties.

Mr. A. KAY spoke strongly against municipal trading, which, he contended, must strangle private enterprise. He pointed out that there were 15,000 employees in Glasgow paid by the Corporation, and said it seemed to him to be against the truest interest of the nation that what should be non-partizan should be used as a political organization. He thought it was the duty of the Government to put some check on municipal trading.

After some remarks by other speakers,

The CHAIRMAN replied to a few points raised during the discussion, and the proceedings closed.

On the same evening, a discussion on the subject took place at the Junior Constitutional Club—Sir W. T. MAKINS, Bart., presiding.

The CHAIRMAN, in opening the proceedings, said that in objecting to the enterprises undertaken by municipal bodies, there was no intention to find fault with the well-understood functions of local government. It was only when councils went beyond those duties that the objections to what was known as municipal trading came into force. Many municipalities had taken up electric lighting, but few had made the business commercially successful.

REPAIRS ARE REDUCED TO A MINIMUM

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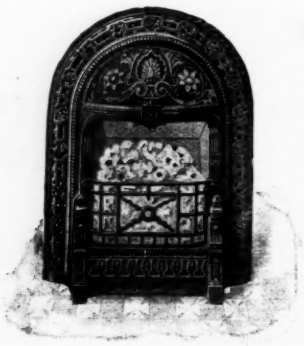

"Eureka"

Gas-Fires

FOR HIRING OUT.

Lord CLAUD HAMILTON said the importance of the question before them was well known; but it had been greatly increased by the series of articles which had appeared in "The Times," which had dealt with the subject in principle and in detail in the most masterly manner, and had brought home to their minds many of the dangers of municipal trading which had not occurred to them in the course of ordinary consideration. In the Municipalities of Liverpool and Birmingham, this system of trading was first introduced; Sir Arthur Forwood and Mr. Chamberlain being the leading spirits. Neither, he thought, realized at the time the consequences of the examples they were setting. He thought the Colonial Secretary must now begin to appreciate some of the dangers of municipal trading. The London County Council had done a good deal of honest, useful work; but, on the other hand, it could not be denied that, instigated by Labour members, Socialists, and Radical wirepullers, that body had embarked upon undertakings fraught with danger to private enterprise and the interests of the general community. Business men could not be expected to give their time to municipal duties when these involved attendance upon committees for the management of undertakings competing possibly with industries in which, as private traders, they were interested. As a result, the character and position of municipal representation would deteriorate, and the control of local affairs would be in danger of passing into the hands of needy professional politicians having their own ends to serve. Another danger arose from the increase in the number of municipal employees. In Birmingham, the Town Council employed more than 7000 men; and if the Council took over the tramway system, the number would be 8500. The danger to municipal life arose from the voting power of these employees anxious for the promotion of industrial enterprises, and supported as they would be by Trade Unions and other Socialistic bodies. He illustrated this danger by reference to the pledges given to working-class voters by parliamentary candidates for the representation of Woolwich and Devonport. He was well aware of the pressure brought to bear upon candidates in the heat of a contested election, and of the consequent dangers which might result from the mad course of trading which some municipalities were favouring, and which every Englishman who respected our parliamentary and municipal institutions should strenuously resist. If once they ceased to be independent representatives, and became mere delegates, they could bid good-bye to the present system of government.

Increased Purifying Plant for Widnes.—Alderman Timmis, in proposing the adoption of the minutes of the Gas and Water Committee at the last meeting of the Widnes Town Council, said the Gas Engineer (Mr. Isaac Carr) had recommended the provision of additional purifiers. The Council would see that this was necessary, having regard to the fact that the gas manufactured had increased from 122 million cubic feet in 1890 to 266 millions last year.

ELECTRIC LIGHTING NOTES.

Failures at Bootle.

Last Thursday night the electric light at Bootle suddenly failed, leaving the whole community in darkness for half-an-hour between half-past nine and ten o'clock, so far as the use of electricity as an illuminant was concerned. A similar failure of the light was also reported at a later hour. In both cases the accident is understood to have arisen from a breakdown at the generating station. During these periods of darkness, the current which drives and lights the cars, being obtained from a different source, was uninterrupted.

The Cooper-Hewitt Vacuum Lamp.

Writing on the subject of "Illumination by Electric Light," in the current number of "The Power and Lighting Economist" (Troy, N.Y.), Mr. H. B. Gear says: "Electric lighting is roughly divided at present into the two forms familiar to all, arc and incandescent; but it is quite likely that coming years will witness the addition to these of some form of vacuum lighting, signs of which are already evident in the horizon." After dealing with the two first-named divisions, the author "damns" with very "faint praise" the vacuum lamps recently on show in London (as referred to in the last two issues of the "JOURNAL"). He says that the vacuum lamps of Moore and Cooper-Hewitt "present hopes for a kind of lighting which, if perfected, would be revolutionary." As yet, however, their imperfect state precludes their consideration commercially. "We can only imagine what they may do."

Ratepayers Ignored at Tiverton.

Another meeting of the Tiverton Town Council was held yesterday week to consider the question of the electric light. This time the Council started with a clean slate, for the Standing Orders were suspended, and all previous resolutions on the subject rescinded. Alderman Amory moved that the offer of Messrs. Christy Bros., which found most favour at the recent meeting of the ratepayers (*ante*, p. 173), be accepted. This firm proposed that the Corporation should find the capital (£10,000) for the erection of the works, and that they should be granted a lease for 21 years, on condition that they pay the interest and sinking fund, and hand over to the Corporation one-third of the net receipts. Mr. J. Thorne seconded the motion. After considerable discussion, the Council again rejected Messrs. Christy's scheme; the voting being 9 for the resolution and 13 against. Another resolution in favour of the scheme submitted by Messrs. Crompton and Co. was also rejected; and the Council finally, by 13 votes to 10, reaffirmed its opinion in favour of a municipal undertaking. This decision is in direct opposition to the recommendation of the public meeting, which almost unanimously rejected the proposal for a municipal scheme.

Dissatisfied Co-operators in Durham.

At a recent meeting of a co-operative concern in Durham, attention was called by a member to the increase in the account for gas,

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	YORK	750,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	ROCHESTER	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	KINGSTON, ONT.	300,000
COLCHESTER	300,000	CRYSTAL PALACE DISTRICT	2,000,000
BIRKENHEAD.	2,250,000	DULUTH, MINN.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CATERHAM	150,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	LEICESTER	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	ENSCHEDE (HOLLAND)	150,000
HALIFAX	1,000,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
TORONTO	250,000	BURNLEY	1,500,000
OTTAWA.	250,000	KINGSTON-ON-THAMES	1,750,000
LINDSAY (Remodelled)	125,000	ACCRINGTON	500,000
MONTREAL	500,000	TONBRIDGE	300,000
TORONTO (Second Contract Remodelled)	2,000,000	STRETFORD	500,000
BELLEVILLE	250,000	OLDBURY	300,000
OTTAWA (Second Contract)	250,000	TODMORDEN	500,000
BRANTFORD (Remodelled)	200,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
ST. CATHERINES (Remodelled)	250,000	YORK (Second Contract)	750,000
KINGSTON, PA.	125,000	ROCHESTER (Second Contract)	500,000
PETERBOROUGH, ONT.	250,000	NEWPORT (MON.)	250,000
WILKESBARRE, PA.	750,000	TOKIO, JAPAN.	1,000,000
ST. CATHERINES (Second Contract)	250,000	PERNAMBUCO (Brazil)	125,000
BUFFALO, N.Y.	2,000,000	MALTON	150,000
WINNIPEG, MAN.	500,000	DULUTH, MINN. (Second Contract)	300,000
COLCHESTER (Second Contract)	300,000	BROCKVILLE (ONT.)	250,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.), 1,000,000 Cub. Ft.
GRAVESEND, 300,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft. TORONTO (3rd Cont.), 750,000 C. Ft.

water, and electricity in the past quarter; the total being £49 6s. 2d., against only £23 12s. 5d. for the corresponding quarter of the previous year. He said he was given to understand that electricity was to be cheaper than gas. The Secretary said the account for electricity was three times as much as it had been—it was £20 more than it was a year ago. Electricity was not only a very dear thing, but the lights went out on several occasions on Friday and Saturday nights—the busiest nights in the week. The light had not been satisfactory, and the Committee had decided that if it continued as it was at present it would be necessary to go back to gas. The President also spoke of the heavy cost of the light. In some places it was found cheaper than gas; but he was sorry to say they had found it dearer. They had tried the light and had found it wanting. But they would try it again; and if it did not prove satisfactory at the end of the quarter, gas would be substituted. A member asked if the increased cost was not accounted for by the fact that there were more electric lights than there were formerly gas-lights. The Secretary said there were, but the light was not so good. Moreover, it did not afford any warmth; and the employees complained that in cold weather they could hardly do their work. The matter then dropped; but from the tone of the speeches, it will be taken up again at the next quarterly meeting.

Dissatisfied Consumers at Aldershot.

We learn from a local paper that the majority of the users of electric current at Aldershot are anything but satisfied with the accounts recently rendered by the Electric Lighting Committee of the District Council. Two letters and a petition were sent to the Committee asking for a reduction. The writer of one letter pointed out to the Committee that the price of electricity compared very unfavourably with that charged for gas, and he informed them that, unless they could reduce the figures all through from 6d. to 4d. per unit, he would have to cut off the supply and use gas. He stated that for the corresponding quarter of the previous year the gas bill for the whole of his premises, including workshops and a gas-engine, did not amount to the sum charged for current, the use of which was confined to the shop. The other writer returned his accounts with the following pithy letter: "I think my bill enormous—over £28 for one quarter. Unless you can make a deduction, I shall have to return to the old method—gas. These charges are a lot too much. Cannot you meet me in some way? I should suggest 4d. per unit all round." The petition bore the signatures of 16 consumers—occupying, for the most part, premises in Wellington Street—who strongly protested against the high rate of 6d. per unit, which they thought should be brought down to a uniform figure of 4d. They said they had compared their accounts, and were unanimous in deciding that the rates charged were very exorbitant. The expense was greatly in excess of gas; and they therefore asked the Committee to advise the Council to go into the matter seriously and at once, in order that this heavy grievance "might be rectified at the earliest possible moment." The Committee considered the communications, but declined to recommend any reduction at present. The subject came before the Council at their meeting on Wednesday, and gave rise to some interesting remarks. The Electric Lighting Engineer was in attendance, and, in reply to a question, stated that the average charge for current was 4·6d. per unit—a little over 4½d. The Chairman said this was almost within the price asked for in the petition. Mr. Calvert, the Chairman of the Committee, said they had gone very carefully into the matter, and found that they could not supply at 4d. This was the plain truth. The consumers ought not to forget that the town had invested £20,000 in order to be in a position to supply electric light. Mr. Robertson said he reckoned that the town would have to spend no less than £1200 per annum as the result of establishing electric light works. This large sum would have to come out of the rates, and the majority of it would have to be paid for by the poor. The working man, who could least afford to pay for it, would have to bear his share of the £1200, which every year would have to be deducted from the rates. And yet the consumers were clamouring now for a reduction in the cost of the light, while the poor ratepayer was the one who was taxed with the burden. Mr. Calvert said the Lighting Committee could not interfere, as the Council had placed the control of the undertaking in other hands. The existing agreement would expire in March, and after that time he would willingly lay a balance-sheet before the ratepayers. The town having invested a large amount of money in order to supply the electric light, it was the duty of the consumers to pay what was necessary. They ought to be pleased to pay, as they were getting their light at a very fair price; and if they compared it with what was charged in other towns, they ought to consider themselves fortunate. The Clerk remarked that at present the works had only cost £120 out of the general rate. Mr. Robertson said he was aware of it. They were taking the "jam" now; but let them wait, as depreciation of plant would have to be considered. The matter then dropped.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Greenock Corporation last Tuesday discussed the report of the Committee upon the quantity of coal in store, which I gave last week. In moving the adoption of the report, Mr. Morison, the Convener of the Gas Committee, said that the Special Committee upon the question of the quantity of coal in stock at June 30 last, was appointed on the motion of ex-Bailie Mitchell, to consider the statement that the amount said to be in stock was not there. The Committee had several meetings, and to none of these did Mr. Mitchell submit any evidence in support of his statement. But in view of the serious questions raised, the Committee had the coal in stock on Dec. 10 measured by experts; and they found that the quantity exceeded that stated in the books,

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WORKING ORDER, is what

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as certified by the Auditor, by 273 tons. He was surprised that Mr. Mitchell should make statements so serious, and when put to the test have nothing to submit in support of them. The Convener went on to refer to questions of wages and leakage; and as to the latter, he mentioned that on the previous Saturday he visited thirty properties in the town, and found the stair lights full on. With regard to this, it was proposed to fix a dozen meters on various properties, to ascertain the quantity of gas consumed in the stair lights. The Corporation took no further notice of the coal question; but after a conversation upon the questions of wages and leakage, they adopted the report.

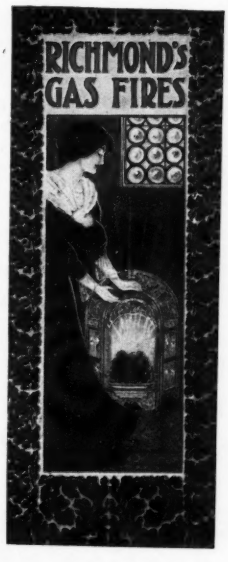
Somewhat extensive alterations and additions to the works of the Coupar Angus Gas Company are on the eve of completion. They include the erection of a new retort-house and a bench containing seven retorts, a condenser, a Creek patent washer, liquor tanks, and a new chimney. Offices and store-rooms have also been erected. The works carried out were designed by Mr. W. B. M'Lusky, of Perth. The apparatus has been fitted, and the large iron roof erected, by Messrs. Henry Balfour and Co., of Leven; the extensive brickwork, by Mr. C. M. Hamilton, of Hamilton; and the stonework, by Mr. James Bruce, of Coupar Angus.

The "Perthshire Advertiser" on Wednesday last contained the following paragraph: "Although the question of the increase in the gas bills has for some time been overshadowed by the larger, but apparently no less intricate, question of the acquisition of the tramways, it has not been altogether left in abeyance. The Convener has left nothing undone that would tend to solve the difficult problem. Ever since his appointment to the convenership, ex-Bailie Cuthbert has been prosecuting investigations in different quarters. As a result, it is likely the Council will, at an early date—probably Monday—have the opportunity of listening to the Convener's report on the subject. We understand that he has not been able to ascertain the exact cause of the increase in the bills. This means that the Council will be compelled to make the gas consumers pay their bills in full, or else prepare a scheme of compromise." The writer is wrong in the alternative conclusion he comes to. The only course the Town Council can follow is to compel payment. It is not open to them to compromise. An individual case here and there, upon cause shown, no one would object to being compromised, but a wholesale movement such as is here contemplated is not to be thought of. It would be a suicidal policy to adopt. But, further, it would be quite open to any consumer to compel the councillors to make good the amount they might remit. In any event, the Auditor would almost certainly do it; so that it is time the Council gave up the drivelling policy into which they have drifted upon this matter, and took their stand upon the only safe ground which they have—that of the truth and the right.

I suppose the decision of the Second Division of the Court of Session, given in the "Legal Intelligence" this week, disposes of the last of the legal questions which are likely to arise out of the great explosion of gas in Edinburgh in July, 1901; for it is highly improbable that the opinion of the House of Lords will be taken upon it. But it is a decision which, I think, could well stand revisal. It is common ground that the explosion was occasioned by the fault of one or other, or both, of two sets of defenders, and that the occupier of the shop which was wrecked suffered loss by that fault. Yet both defenders go free because the pursuer cannot say which of them was liable. It seems to me to be a strange doctrine to hold that a man who is entitled to compensation, and who proves that two people are liable to him, shall get nothing unless he can satisfy a Judge which of the two is the one who is liable. Lord Moncrieff, with the concurrence of his colleagues, professed to treat the question as a jury one; yet he has laid down a law which must, as he himself said, affect other cases. The decision is, indeed, of general interest, because, if it stands, the doctrine will be applicable to liability in all walks of life. It will not affect the owners of gas undertakings more than any others; but they will share in its beneficent, or other, resulting effect, and if it is to be the law of the land it is as well that they should know it. A curious state of affairs has developed since the decision was given. It turns out that an action was brought against the same defenders by a grocer whose premises were also wrecked, and that the defenders compounded by a payment of £300. Now that they have been declared to be free of liability for the accident, I am told that they are considering how they can recover the money they paid. Certainly, a strange situation is created.

The serious statement is made that the Corporation gas-works at Kilsyth have sustained damage by underground workings, and that a claim for compensation is to be made upon Messrs. W. Baird and Co., coal and iron masters. An increase during the month of 322,400 cubic feet of gas was reported. Thereupon Mr. Freebairn expressed the opinion that the great rise was due to the gas consumers, in order to get a good light, passing a great deal more gas; and he thought they should rather have a better light given them than try to make profit. Provost Wilson effectually silenced this gentleman by remarking that, so long as he could remember, the same complaint had been made, and that the Gas Manager had called his attention to the fact that the gas accounts of some of the largest shopkeepers were just about half what they used to be, which showed there was no foundation for the complaint that had been made.

The Town Council of Hamilton are negotiating with the Caledonian Railway Company with respect to proposed legislation by the Company; and in connection with the subject, there has been brought forward again a proposal to construct a railway siding into the gas-works. To do this, some properties require to be purchased, and terms agreed upon with the Railway Company. It is estimated that the cost of the siding will be about £3000, but that it will effect an annual saving to the gas undertaking of £400. This is a very good return; and there is no difference of opinion in the Council as to the desirability of making the connection with the railway. But more information is desired by most of the members. The subject was accordingly dropped this week, to allow of fuller information being laid before the Council on a subsequent occasion.



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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 24.

Sulphate of Ammonia.

There has been a strong market, and all parcels offered have met a ready sale at hardening prices, the closing quotations being £12 7s. 6d. per ton f.o.b. Hull, and £12 7s. 6d. to £12 8s. 9d. per ton f.o.b. Liverpool and Leith. There has been a certain amount of direct buying, but again the bulk of the output has been taken for covering contracts. Interest in the forward position has also revived, and, £12 7s. 6d. per ton having been paid f.o.b. Leith for delivery over the spring months, makers have advanced their prices to £12 10s. and £12 12s. 6d. per ton, according to position. April-September, after having been sold at £12 5s. per ton, is now held for £12 7s. 6d.

Nitrate of Soda.

Though firm on spot at 9s. 1½d. to 9s. 3d. per cwt., according to quality, this article has not yet in Germany recovered from the depression occasioned by severe weather, and at Hamburg there are sellers at below the parity of 9s. per cwt.

LONDON, *Jan.* 24.

Tar Products.

There is nothing very special to report as regards business, prices, as a rule, remaining in about the same position. Pitch continues very firm; but there is scarcely so much demand for prompt as was the case a little while ago. As against this, however, large inquiries are being made for July-December delivery, and in some instances consumers seem disposed to treat for January-June, 1904, although, of course, at a considerable reduction in price. Crude carbolic is rather better. Business is reported in 60's. at 1s. 7d. prompt, and at 1s. 7¼d. for February-June. Crystals are slightly firmer; but prices remain practically unchanged. There is a fairly good business doing in 34-35's, for early delivery. In 90 per cent. benzol, business is reported at a little under 10d. prompt; but for February-June makers ask 10⅛d. In 50-90 per cent., business is reported at 8½d. for February-March, and an offer of this price was declined for the whole of the present year. The demand for creosote continues fairly good; and prices are firm for both prompt and forward delivery. In solvent, there has been a little more business doing for home consumption, but at very low prices. Small sales of anthracene are reported for early delivery; but prices have ruled very low. In toluol, there is really nothing doing.

The average values during the week were: Tar, 22s. 6d. to 27s. Pitch, London, 58s. 6d. to 60s.; east coast, 56s. to 57s. 6d.; west coast, 55s. to 56s. Benzol, 90 per cent., 9¾d. to 10d.; 50-90 per cent., 8d. to 8½d. Toluol, 7½d. Crude naphtha, 3¼d.; solvent naphtha, 8⅜d. to 9½d.; heavy naphtha, 9d. to 10d. Creosote, London, 1⅞d. to 1¾d.; North, 1⅜d to 1½d. Heavy oils, 2d. to 2¼d. Carbolic acid, 60 per cent., 1s. 6½d. to 1s. 7d. Naphthalene, 35s. to 55s.; salts, 25s. to 27s. 6d Anthracene, "A" quality, 1¼d. to 1⅜d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market continues very firm; and there is a strong inquiry for prompt delivery. The Gaslight and Coke Company quote £12 10s. for February-March, but would not sell any quantity at this price. There are inquiries for May-September, for which Beckton price is £12 6s. 3d. Another large London gas company has sold at £12 10s. for prompt, and would still accept this price for February-March. In Hull, business was done at £12 8s. 9d. for prompt; but makers ask £12 10s. for February-March. In Leith, business is reported at £12 10s. for prompt; and makers are believed to be asking a little higher price for February. In Liverpool, there does not appear to be much business; but the value may be taken as from £12 8s. 9d. to £12 10s.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Trade is moving on steadily, with a general firmness in prices, though with no really quotable advance upon late rates. House-fire coals are not in quite so active demand since the break up of the frost; and although collieries are moving off what they are raising, there is no scarcity of supplies, with prices not more than maintained at the list basis rates recently quoted. Some improvement is reported in the lower qualities of fuel; and in these there is a tendency to harden prices where previously they were being cut low. Common round coals are reported to be moving away more freely for iron making and general manufacturing purposes, with prices firm at about 8s. 6d. to 9s. for good ordinary descriptions, and 9s. 3d. to 9s. 6d. quoted in some special cases at the pit mouth. In the first place, the continued shipments of slack, chiefly the lower qualities, are clearing surplus supplies off the home market; so that there is an absence of that pushing of cheap lots which was tending some short time back to bring down prices in the commoner sorts of engine fuel. In the next place, there is a large demand coming on the market in connection with requirements for the numerous electrical traction power stations, which is likely to be not only a permanent, but a steadily increasing demand. The general result is a stiffening in prices to full quoted rates, common slack averaging 4s. 6d. to 4s. 9d. per ton at the pit, medium 5s. 6d. to 6s., and best slack from 6s. 6d. up to 7s. and 7s. 3d. A fairly brisk business continues to be reported for shipment, both in steam coals and engine fuel, with prices averaging 11s. per ton for good steam coals, and from 6s. up to 7s. for slack, delivered at the ports on the Mersey.

Northern Coal Trade.

Though there is a full demand for coals, yet the interruptions and delays by fog have made the shipments rather irregular; and some of the collieries have had at times to make a slight concession in the price to enable full work to be continued. There is still some demand for coal for the United States supporting the market; but it is not so easy to arrange sales as it was. Best Northumbrian steam coals are

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FOR ENRICHING GAS IN BULK.

PREVENTS NAPHTHALENE DEPOSITS.

OVER 100 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Seven Years.

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

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Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

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THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

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about 11s. 3d. per ton f.o.b., second-class steams are 10s. 3d. to 10s. 6d., and steam smalls are 5s. 9d.—the output being well taken up, except under the circumstances above hinted at. Gas coal is in heavy request; and the output is taxed to meet the demand. Contracts are well kept up to, and take a large part of the production. There is little change in the prices quoted—from 9s. 9d. to 10s. per ton f.o.b. for best Durham gas coals for occasional sales; contracts, of course, being at a much lower price. Gas coke, though more abundant, is relatively high at from 13s. 6d. to 14s. per ton f.o.b. Newcastle.

Scotch Coal Trade.

Trade is active, and there is every prospect of its remaining so, although it cannot be said that there is any special feature in the home market which should make a more than usual demand. Prices are well maintained, and are likely to be so for some time. The quotations are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. to 10s. 9d., and splint 11s. to 11s. 3d. The shipments for the week amounted to 155,397 tons—an increase of 32,960 tons upon the previous week, but a decrease of 3910 tons upon the corresponding week of last year. For the year to date, the total shipments have been 343,696 tons—a decrease of 44,304 tons upon the same period of last year.

Proposed Appointment of an Assistant Gas Engineer at Wigan.—The Wigan Gas Committee having fully considered the duties of the Gas Engineer (Mr. J. Timmins) and the management of the gas-works generally, have agreed that an Assistant Gas Engineer should be appointed. They have therefore decided to advertise for applications for the position, the salary to be £150 per annum.

Compensation Water Arbitration at Shipley.—An Arbitration Court was held at the Midland Hotel, Bradford, last week, with Mr. Henry Rofe as Umpire, with regard to a claim by the owners of the Baildon Bridge Mills for damages from the Shipley District Council for alleged failure to send down compensation water as required by the Shipley Water-Works Act of 1854. The Act provides that water shall be passed through a gauge at Eldwick for 15 hours out of every 24 hours, to flow into the River Aire. The claimants contended that during the past three years the gauge at Eldwick had not been kept in proper order, and that an insufficient volume of water had been sent down. Evidence in support of this contention was given by Mr. Charles H. Gott, and Mr. James Watson. For the District Council, it was contended that no action could lie against them which was not brought within six months of the commission of the offence. It was further urged that the fault of the gauge was due to an obstruction in the Eldwick Beck, not in the Council's property; and it was more the duty of the millowners than of the Council to see that the beck was kept clear. The Council, it was stated, had sent down the full volume of water so long as they had it; and they were prepared to carry out their statutory obligations. Mr. H. A. Johnson having given evidence for the Council, the proceedings ended. Mr. Rofe will make his award in due course.

Explosion at the Hindley Gas-Works.—Shortly after 9 o'clock on Thursday morning, an explosion occurred in the meter-house at the Hindley Gas-Works. The house (which has only been erected about twelve months) was completely demolished; but the meter and other fittings remain intact. The Gas Engineer (Mr. W. Dickinson) had just left the building—being only a few yards away from it when the explosion took place. It is not definitely known how it was caused.

Quality of the Gosport Water Supply.—A public meeting in Gosport, held under the auspices of the local Ratepayers' Association, has unanimously condemned the source from which the Gosport Water Company at present draw their supply, and has called upon the Company to entirely close the same until such time as it can be proved, on the evidence of an expert, to be absolutely free from sea-water contamination. The water complained of is obtained from wells at Foxbury, concerning which some very disquieting reports have of late been circulated.

The Gas-Works Purchase Question at Wellington (Salop).—Since the meeting of ratepayers and owners at Wellington, Salop (*ante*, pp. 117, 171), to consider the proposal of the Urban District Council to purchase the Gas Company's undertaking, preparations have been made for a poll of the town, which was demanded by Mr. J. T. Carrane, on behalf of a client. The Council's Bill has, however, now been withdrawn; and Mr. Carrane has also withdrawn the demand for a poll. The Council will oppose the Company's Bill unless certain concessions are made.

New Joint-Stock Companies.—The Plaissetty German and American Concessions Company, Limited, has been registered, with a capital of £10,000 in £1 shares, to acquire the patents and all rights for Germany, the United States of America, and Canada in an invention by A. M. Plaissetty for improvements in the manufacture of incandescent filaments and mantles, and to carry on the business of manufacturers of, and dealers in, mantles, burners, and incandescent accessories, &c. There will be no initial public issue. The first Directors (to number not less than three nor more than five) are Messrs. J. de Lara Cohen, J. P. H. Soper, J. C. Webb, and T. Terrell. Under the title of the London Scottish Foundry, Limited, a Company has been registered, with a capital of £25,000 in £1 shares, to acquire certain factories and premises at Barking, Essex, owned and occupied by Dendy and Mathieson; to adopt an agreement with Messrs. Wilsons and Mathiesons, Limited; and to carry on the business of iron and metal founders, heating, lighting, ventilating, and general engineers, stove manufacturers, &c. There will be no initial public issue. The first Directors are Messrs. W. Mathieson, T. A. Draper, A. Mathieson, H. Wilson, J. W. Wilson, and C. A. Wilson. Under the rather strange title of "The Half-Crown Company, Limited," a Company has been registered, with a capital of £1000 in £1 shares, to carry on the business of dealers in burners and apparatus for incandescent gas lighting. A Company has just been formed in Brussels under the title of "Thermo-Lux," with a capital of £8000, for the manufacture and sale of heating and lighting appliances.

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Gas Workers in the Provinces.—The publication of four more county volumes of the 1901 census shows that in the administrative counties of Northampton, Cumberland, Berkshire, and Wiltshire there were enumerated 377, 251, 219, and 237 persons respectively as engaged in gas-works service.

Gas or Electricity Works Purchase at Winchester.—It is reported that the Winchester Town Council are not likely to proceed further in the matter of the proposed acquiring of the gas and water undertaking, the purchase-money being too formidable. The electric light works are, however, expected to be taken over in the near future, as the method of purchase is already provided for.

Tin-Lined Pipes for Water Supply.—The District Councils of Kirby-moorside and Pickering have just completed a scheme for the supply of water to Spaunton, Lastingham, and Appleton-le-Moors. The capacity of the service reservoir is 40,000 gallons, and the total length of pipes about 6 miles. A feature of the scheme is the use of tin-lined service-pipes, to prevent the water coming in contact with lead. Tin-lined iron, or "Health," pipes are also employed.

The Carlisle Water Scheme.—At a special meeting held last Tuesday, the Carlisle Corporation discussed for three hours the report of Messrs. J. Mansergh and Sons on the Geltsdale and other schemes for the supply of water to the city, to which reference has already been made in the "JOURNAL" (*ante*, pp. 85, 117). In the result, the whole question was referred to the Geltsdale Committee, with a request that they should submit to a future meeting of the Council a recommendation as to the course to be followed.

Serious Gas Explosion at Beckton.—The premises at Beckton of Mr. John Savage, ex-Chairman of the East Ham District Council, were the scene of a serious gas explosion early last Tuesday morning. It appears that Mr. Savage noticed a smell of gas, and opened the back parlour door. A quantity of gas immediately rushed out of the room, and came into contact with the hall lamp, with the result that a loud explosion occurred. Mr. Savage was seriously injured; and the greater part of the house was demolished. Mr. Savage's son, who was sleeping in an upper room, was blown out of his bed by the force of the explosion, and sustained some minor injuries.

Complaints at Chapel-en-le-Frith.—A meeting of the inhabitants of Chapel-en-le-Frith has been held to consider what steps shall be taken respecting the poor quality and impurity of the gas supplied to the district. Mr. T. Howarth, who presided, stated that the proprietor of the gas-works had been written to for years, but had never replied. The quality of the gas was unbearable; and they had not even known the candle power of the illuminant, for which they paid the ridiculous price of 5s. 6d. per 1000 cubic feet. Mr. Heathcott suggested that the whole of the facts should be placed before the Board of Trade, as the public were being both poisoned and punished. The Vicar spoke of the unpleasant atmosphere in the church, owing to bad gas. It was ultimately decided that the Board of Trade should be placed in possession of the facts, and asked for their advice.

Water Supply to Mid Kent Parishes.—The Hollingbourne Rural District Council have decided not to oppose the application of the Mid Kent Water Company for a Provisional Order to enable them to supply a number of parishes with water, provided the time for carrying out the necessary works is reduced from six years, as proposed by the Company, to three.

Sales of Stock.—Last Tuesday, Mr. Charles A. Joel sold by auction £60,000 of ordinary stock of the Newcastle and Gateshead Water Company, at prices ranging from £150 10s. to £152 10s. per £100 of stock. Messrs. Alexander, Daniel, and Co. on Thursday disposed of £15,000 of Bristol Water-Works 7 per cent. maximum consolidated ordinary stock, at prices ranging from £150 to £152 per £100 of stock.

Gas Heating at the Imperial Palace at Vienna.—Heating by gas has been introduced recently, according to "Der Gastechniker" in the Imperial and Royal Palace ("Hofburg") at Vienna. Many corridors and rooms immediately adjoining the apartments of the Emperor, and almost daily used by him, have been heated by gas. Several offices and the apartments of the guard have been similarly heated; and in the household rooms a number of gas-fires, gas cooking-stoves, and ironing appliances have been fixed. All the gas apparatus has been supplied and installed by the firm of William Ritter, of Vienna; and the whole of the arrangements are said to work perfectly satisfactorily.

A Road on Fire.—The unusual spectacle of a roadway in flames was witnessed in Osnaburgh Street, Regent's Park, last Thursday. A strong smell of gas induced one of a gang of men breaking up the road to light a match. A trail of fire immediately spread to a newly-filled trench, from the loose stones of which the gas was escaping. Until the main could be cut and the flames extinguished, all the traffic had to be stopped. The leakage is thought to have been due to the sandy nature of the ground, which had probably been washed away, leaving the gas-main unsupported, and thus opening one of the joints. It appears that this is not the first accident that has taken place at this spot, due to the nature of the earth. Some time ago, two men, while engaged in excavating work, were buried by a fall of sand.

Burley-in-Wharfedale Water Scheme.—The new water-works scheme promoted by the District Council of Burley-in-Wharfedale is proving much more expensive than was at first expected. The parliamentary powers obtained by the Council allowed them to borrow money to the extent of £12,000; and though they have exercised these powers to the full, they have had to seek authority to borrow an additional £5000. It was stated at a Local Government Board inquiry, conducted by Mr. E. A. Sandford Fawcett, that the scheme included the purchase of water rights on a gathering-ground covering 300 acres of land on Burley Moor, and of 17 acres for the construction of a new reservoir. The purchase price of the water rights and land was fixed by arbitration; and the award greatly exceeded the estimate. This was one of the causes of the need for further borrowing powers.

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Reduction in Price at Southport.—The illuminating power of the gas supplied at Southport has now been reduced from 20 to 15 candles, and the price from 3s. to 2s. 8d. per 1000 cubic feet. Burners suitable for the lower illuminating power will be furnished to every consumer on application.

North Warwickshire Water Arbitration.—Sir Frederick Bramwell, the Umpire in the recent arbitration between the Coventry Corporation and the North Warwickshire Water Company, has asked for an extension of the time within which to make his award to Feb. 28. The Company, however, decline to agree to a date beyond the end of this month. The Council are anxious to get the matter settled as soon as possible; but at their last meeting the Town Clerk said he did not expect Sir Frederick Bramwell would give his award within the time mentioned by the Company.

Growth of the Driffield Gas Supply.—An encouraging statement as to the progress of the Driffield Gas-Works was made by the Chairman of the Gas Committee (Mr. Charles Smith) at the last meeting of the Urban District Council. He said that the increase in consumption last year over 1901 was 1,894,000 cubic feet; while the amount received on private lighting account for the past quarter was £438 more than in the corresponding period five years ago. There was, he said, every justification for the erection of the large new gas-holder to meet the increased demand, which could not have been provided for under the old conditions of storage. A lot of money had been spent on the works; but they were now a very valuable asset, and quite worth what they had cost.

Explosions of Gas in Edinburgh.—Two explosions of gas have recently occurred in Edinburgh. The most serious was in Buccleuch Street. The National Telephone Company have laid a conduit in this thoroughfare for the accommodation of their wires. The covers of the manholes got fixed by the frost, and fires were lighted to thaw them. About two o'clock in the morning of the 17th inst. there was a loud explosion, the force of which blew off the covers of four manholes, extending over about a quarter-of-a-mile of street. The explosion was due to the accumulation of gas in the conduit and the fire upon the cover of the manhole. It was of great violence, as part of a heavy metal cover was thrown a height of four storeys, and crashed through the roof a dwelling-house. Another fragment, weighing about 10 lbs., was blown across the street and through the plate glass window of a shop. No one was injured. The other explosion took place in the Museum of Science and Art in Chambers Street. As the Museum has now been lighted by electricity for some time, the management have been removing the old gas pipes and meters. On Friday Jan. 16, four plumbers were working in a cellar removing a large meter. One of the men struck a light, and the gas which was in the meter exploded. Three of the men were blown nearly across the cellar by the force of the explosion, and the fourth man was struck on the head by a piece of metal, and was rendered unconscious. He was taken to the Royal Infirmary, and was there found to be suffering from severe shock.

The Trade and Industrial Exhibition recently held at the Macclesfield Drill Hall is an object-lesson not to be disregarded when effective lighting is under consideration. The hall was brilliantly illuminated by the "Keith" light; the total candle-power being 11,200. A No. 3 patent gas-compressor, ten 1000-candle power reflector pendants, and four 300-candle power pendants were used to secure this result, which does great credit to the James Keith and Blackman Company, Limited, whose Manchester office planned the arrangements.

At Chatham, on the 16th inst., before the County Justices, Annie Simmonds and Edith Bennett were charged with breaking open a prepayment gas-meter at No. 78, Rural Vale, Northfleet, and stealing therefrom about 20s. worth of coppers, the property of the Northfleet and Greenhithe Gas Company, on the 11th inst. The Company's Manager (Mr. C. Foster Veevers) having given evidence as to the Company being the owners of the meter, Police-Constable Quested deposed to receiving information just before midnight on the last-named day from a man named M'Dermott, who lived at the house, where the women also resided, that the place had been forcibly entered. He proceeded to the house and saw the two prisoners there. The lock of the meter was gone, and the money-box quite empty. They said the money had been stolen from the meter, and Bennett added that a workbox containing 6s. was also missing. Witness found that two small cupboards had been ransacked, and clothing was lying upon the floor. The next morning witness went again to the house with the Company's collector, who read the meter in the presence of the accused, and it was ascertained that about a sovereign's worth of coppers had gone. From information subsequently received, he went in search of the two women, and apprehended them in High Street, Gravesend. They were taken to the Gravesend police station, charged with stealing the money, and subsequently removed to the Northfleet station, where Simmonds confessed to breaking open the box of the meter because they could not get any gas for cooking their dinner on Sunday. She said she could not put the box back, so she emptied the contents upon the table. They strewed the things upon the floor so as to give the place the appearance of having been broken into, and divided the money—she taking 7s. worth of coppers and Bennett the rest. They went off to Gravesend, and on the road threw the lock of the meter into a field. She expressed her sorrow for what she had done. Evidence having been given by M'Dermott and by the landlord of a public-house at Gravesend where the prisoners had obtained silver for the coppers, they pleaded guilty—Bennett saying, however, that there was only 17s. 10d. in the meter-box. They made out that while cooking the dinner the gas went out, and when they were trying to force in a penny the lock broke. They were frightened, and did not know what to do with the coppers, so they took them out and changed them. They were not in want of money. The Justices' Clerk said it would have been better to have taken them to the Gas Company. Proof having been given of two previous convictions of Bennett, each prisoner was sentenced to fourteen days' hard labour.

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The Directors of the Newcastle and Gateshead Gas Company have resolved to recommend (subject to audit) the payment for the six months ending Dec. 31 of dividends at the rate of 4 per cent. per annum upon the preference stock, and 4½ per cent. per annum upon the ordinary stock. These dividends are equivalent to 5 per cent. on the preference and 9 per cent. on the ordinary stock before conversion, and are the full statutory rates.

Mr. Effingham Wilson has just brought out a second edition of "The Consumer's Handbook of the Law Relating to Gas, Water, and Electric Lighting," by Mr. Lawrence Duckworth, of the Middle Temple, Barrister-at-Law. It was written with the object of explaining to the consumer, as concisely as possible, the law on the above subjects as it specially affects him. By far the larger portion of the book is devoted to water supply; and for much of the information contained in this section he acknowledges his indebtedness to the well-known "Analysis" of Messrs. Alfred Lass, Wood, and Drew. The matter occupies 96 pages, and there is an index.

Although, as a general rule, litigation in which our readers are concerned does not lie in the County Courts, their attention may be directed to a useful book, entitled "The Business Man's County Court Guide," written by Mr. Charles Jones, the third and revised edition of which has just been published by Mr. Effingham Wilson. Mr. Jones has produced a practical manual of the ordinary procedure in County Courts, especially with reference to tradesmen's disputes and the recovery of trade debts; and he gives therein some useful information upon evidence, special defences, &c. The text is followed by appendices containing tables of fees and solicitors' costs, precedents, and useful forms; and there is a full index. The author is a solicitor's clerk, and therefore it may be taken that the information he supplies has been obtained in actual practice.

The twenty-first congress and exhibition of the Sanitary Institute will be opened at Bradford on the 7th of July next.

The Directors of the Weardale and Consett Water Company recommend the payment of a dividend at the rate of 6½ per cent. per annum for the half year to December. This makes, with the interim dividend of 5 per cent., a dividend of 5¾ per cent. for the year.

The clock in the tower of the Houses of Parliament is in future to be lighted by electricity. Nernst lamps of 60-candle power are to be employed, so that when six are in use the total light will be equal to 360 candles. Gas will, however, still be employed for the signal-light which indicates when the House is sitting.

A large water-softening plant has been built at the St. John's Wood works of the Central Electric Supply Company, by Messrs. Mather and Platt, Limited, of Manchester. It is capable of treating 23,000 gallons of water per hour, and consists of four tanks arranged in series. The first of these holds the supply of hard water, while in two others, which are used alternately, the water is softened. The fourth tank acts as a receiver for the softened water, and is 42 ft. 3 in. long, 33 feet wide, and 12 feet deep. The process used is the Archbutt-Deeley. The precipitation-tanks are 24 feet long, 18 feet wide, 12 feet deep.

Mr. Laurence Bell has during the past few years devoted a portion of his time to the establishment of a motor sale and repair business; and this has now grown to such an extent that he has decided to give up the management of the Innerleithen Gas-Works, and to go in wholly for the motor car trade. Mr. Bell has taken premises in Peebles, and starts work there in May. He is confident that there is a big opening in the gas business for motors for coin collecting, district inspectors' work, lorries, and tar and oil waggons, &c.; and therefore he looks forward to keeping up his connection with the industry even though ceasing to be a gas manager.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS VACANT.

DRAUGHTSMAN. Sheffield Gas Company. Jan. 31.
GAS-FITTERS. Long Eaton Gas-Works.
GAS MAKER. Dalton-in-Furness Gas Department. Jan. 28.
MECHANIC AND SMITH. No. 3983.
WATER MANAGER. Airdrie and Coatbridge Water Trustees. Feb. 14.
WORKING MANAGER. St. Paul's Road, Preston.

SITUATION WANTED.

DRAUGHTSMAN. M. M., c/o Street's, London.

"JOURNAL" VOLUMES FOR SALE. Stoneham, London.

MEETINGS OF COMPANIES.

BARNSTAPLE GAS COMPANY. Feb. 14.
CRYSTAL PALACE GAS COMPANY. Feb. 13.
GASLIGHT AND COKE COMPANY. Feb. 6.

PLANT, &c. (Second-Hand), FOR SALE.

CONDENSER. Redditch Gas-Works.
PURIFIERS AND CONNECTIONS. Wright, London.
PURIFIERS, SCRUBBER-WASHERS, GASHOLDERS, AND OTHER PLANT. Firth Blakeley, Dewsbury.
PURIFIERS, WASHER-SCRUBBER, &c. While and Son, London.
RETORT-BENCH FITTINGS. Sheffield Gas Company. Tenders by Jan. 31.
RETORT IRONWORK. Aberdare Gas Company. Tenders by Feb. 10.

PLANT, &c. (Second Hand), WANTED.

METERS (DISUSED), BRASS, COPPER, LEAD ASHES, &c. Smith, Bradford.

SALES OF STOCKS AND SHARES.

HARROW AND STANMORE GAS COMPANY. Feb. 17.
ILFORD GAS COMPANY. Feb. 17.
HORNSEY GAS COMPANY. Feb. 19.
LAMBETH WATER COMPANY. Feb. 16.
SHREWSBURY GAS COMPANY. Jan. 30.
SOUTH ESSEX WATER COMPANY. Feb. 17.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 19.
WEST HAM GAS COMPANY. Feb. 18.

TENDERS FOR

CAST-IRON WORK.

PLYMOUTH WATER DEPARTMENT. Tenders by Feb. 19.

COAL.

BANGOR GAS DEPARTMENT. 1700 tons. Tenders by Feb. 16.

FIRE-CLAY GOODS.

MATLOCK GAS COMPANY. Tenders by Feb. 16.

GASHOLDERS.

COVENTRY GAS DEPARTMENT (Two). Tenders by Feb. 14.
HENLEY-IN-ARDEN GAS COMPANY. Tenders by Feb. 11.

HYDRAULIC AND FOUL MAINS, &c.

CLEVEDON GAS COMPANY. Tenders by Feb. 9.

LEAD PIPE.

PLYMOUTH WATER DEPARTMENT. Tenders by Feb. 19.

LIVESEY WASHER.

STOURBRIDGE GAS DEPARTMENT. Tenders by Feb. 10.

PIPES AND CONNECTIONS, &c.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Feb. 9.

REGENERATOR FURNACES, &c.

CLEVEDON GAS COMPANY. Tenders by Feb. 9.

RETORTS.

MATLOCK GAS COMPANY. Tenders by Feb. 16.

ROOF (Steel).

MANCHESTER GAS DEPARTMENT. Tenders by Feb. 7.

SLUICE VALVES, FIRE HYDRANTS, STOP COCKS, &c.

PLYMOUTH WATER DEPARTMENT. Tenders by Feb. 19.

TANK FOR GASHOLDER.

HENLEY-IN-ARDEN GAS COMPANY. Tenders by Feb. 11.

TAR.

HERNE BAY GAS COMPANY. Tenders by Feb. 9.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

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HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
Jan. 10, 1903.

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No House. The chief Particulars of duties are given.

Further Information, if required, may be obtained on application by letter to the undersigned.

Applications, in own handwriting (with Testimonials, and stating Qualifications, Age, and Wages required), to be delivered at my Office on or before Wednesday, the 28th of January, 1903.

W. RICHARDSON,
Surveyor to the Council.

Dalton-in-Furness,
Jan. 20, 1903.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—Very good Gas Plant as under:—

PURIFIERS—Four, 12 feet square, with 8-inch Centre-Valve and Connections. Planed Joints.
Kirkham WASHER-SCRUBBER, 300,000 cubic feet per diem., with Engine and 8-inch Valves and Connections.
Livesey WASHER, 250,000 cubic feet per diem, with 8-inch Valves and Connections.

Photos. sent on application to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

COAL GAS TAR wanted.

Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered either on Fixed or Sliding-Scale Basis.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE CEMENT, PAINT, GAS COAL.

BALE & CHURCH, 5, CROOKED LANE, LONDON, E.C.

WANTED, old Disused Gas-Meters, BRASS, COPPER, and LEAD ASHES for Cash.

J. SMITH, Broker, Canal Road, BRADFORD.

TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.

Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

A BARGAIN—Water-Cooled Condenser in perfect condition. Capacity 25,000 cubic feet per 24 Hours.

Address A. E. LAYTON, Gas-Works, REDDITCH.

FOR SALE—"Journal of Gas Lighting" Volumes for the Years 1886 to 1900, bound, and 1901 and 1902, unbound.

Address R. C. STONEHAM, 150, Fenchurch Street, LONDON, E.C.

THE Aberdare Gas Company have for SALE the IRONWORK belonging to a Bench of Five Beds of Six round Retorts each (removed to make room for Generator Beds). The goods may be seen at the Gas-Works; and TENDERS for them (not necessarily accepted) are invited, to be addressed to the Chairman on or before Tuesday, the 10th prox.

EVAN JONES,
General Manager and Secretary.

SECOND-HAND PLANT FOR SALE.

J. FIRTH BLAKELEY & CO., Dewsbury, Offer exceptional Bargains for immediate SALE as follows—

Four ANNULAR CONDENSERS, 32 in. by 22 in. by 22 ft. high.
TOWER SCRUBBERS, 3 ft. 6 in. by 30 ft. and 6 ft. by 30 ft. high, &c.
Six 20 feet square PURIFIERS, 10 ft. and 12 ft. square. Several smaller Sets, including One Set of Four 5 feet square, and others suitable for Test Plants.
4-inch, 6-inch, 8-inch, and 12-inch STATION METERS and GOVERNORS.
GASHOLDERS, 12 ft. to 50 ft. diameter complete, and erected and guaranteed in perfect condition.
ENGINES and EXHAUSTERS, from 2000 to 60,000 cubic feet per hour.
LIVESEY WASHER, with 10-inch connections.
HOLMES PATENT WASHER-SCRUBBER.
CLAPHAM'S PATENT WASHER-SCRUBBER.

All overhauled, refitted, and guaranteed perfect. No reasonable offer refused.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply, delivery, and erection on their Gas-Works of a LIVESEY WASHER, to pass 2,000,000 cubic feet per day, complete with Valves and Connections to existing Mains.

Tenders to be addressed to the Chairman of the Gas Committee, endorsed "Washer," and sent to me at the Stourbridge Gas-Works not later than Tuesday, Feb. 10, 1903.

By order,
WM. NORTH,
Engineer and Manager.

Gas-Works, Stourbridge,
Jan. 20, 1903.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

1550 TONS OF 24-INCH CAST-IRON MAINS.

THE Gas Commissioners are prepared to receive TENDERS for the supply and delivery of about 1550 Tons of 24-inch diameter Cast-Iron Spigot and Faucet MAIN PIPES, in 12-feet lengths, along with CONNECTIONS and SPECIALS.

Contractors may also quote for Pipes to their own patterns, but not exceeding the specified weight.

Deliveries to be in regular weekly quantities as required, commencing at the end of March, and continuing up to the 30th day of September next.

The Pipes to be delivered on the North British or Caledonian Railway Systems, or free on rail at Leith or Granton Harbours.

Specifications, Schedules, and Forms of Tender may be obtained upon application to Mr. W. R. Herring, Chief Engineer and Manager, New Street Works Edinburgh.

Tenders to be lodged with the undersigned on or before Monday, the 9th day of February, 1903, not later than Ten a.m., endorsed "Tender for Main Pipes."

The Commissioners do not bind themselves to accept the lowest or any Offer, and reserve to themselves the right of accepting the whole or any portion of the material tendered for.

JAMES M'G. JACK,
Clerk to the Gas Commissioners.

25, Waterloo Place, Edinburgh.
Jan. 6, 1903.

SHEFFIELD UNITED GASLIGHT COMPANY.

SECOND-HAND RETORT-BENCH FITTINGS.

THE Directors of the above Company have FOR SALE the HYDRAULIC MAINS, DIP-ARCH, ASCENSION, and STAND PIPES comprised in ten through Settings of 21 in. by 15 in. D-shape Retorts.

The whole of the Plant is at present at work, and in good condition.

Further Particulars may be obtained on application to the Engineer, Mr. J. W. Morrison, at the Company's Offices, Commercial Street.

Tenders, addressed to the undersigned, to be sent in not later than Saturday, Jan. 31, inst., endorsed "Second-hand Fittings."

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
Jan. 10, 1903.

THE Directors of the Clevedon Gas Company invite TENDERS for the erection of Four Benches of REGENERATOR FURNACES, including Foundation and Subways, &c., Hydraulic and Foul Mains, and all Ironwork connected therewith.

Drawings may be seen, and Specification and Bill of Quantities obtained, at the Company's Office, Moor Lane.

Sealed Tenders to be addressed to the undersigned, and delivered not later than Monday, Feb. 9, 1903.

Jos. HARGER PYE, Assoc.M.I.Mech.E.,
Engineer and Manager.

Gas-Works, Clevedon, Somerset.

HERNE BAY GAS AND COKE COMPANY LIMITED.

TAR.

THE Directors of the above-named Company are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works from Jan. 1 to Dec. 31, 1903.

It is estimated that the quantity will be about 36,000 gallons.

Form of Tender to be obtained from, and Tenders, quoting Prices free on rail and in Barge at Herne Bay in Purchaser's own Casks, should be sent, on or before Monday, Feb. 9, 1903, to the undersigned, at 6, Bream's Buildings, Chancery Lane, London, E.C.

By order,
H. E. NEWTON,
Secretary.

TENDERS FOR COAL.

THE Urban District Council of Bangor (Ireland) invite TENDERS for the supply of about 1700 Tons of best double-screened GAS COAL, to be delivered into Carts at Bangor Quay at such times and in such quantities as may be required from April 1 next.

Tenders should be accompanied by Analyses, placed in sealed envelopes, marked "Tender for Coal," and must reach me on or before the 16th day of February, 1903.

No Tender Forms issued.

The Council do not bind themselves to accept the lowest or any Tender.

The Council will require security for the due and faithful performance of the contract.

By Order,
JAMES MILLIKEN,
Clerk to the Council.

Town Hall, Bangor, Ireland,
Jan. 22, 1903.

TO GASHOLDER MAKERS.

THE Coventry Corporation Gas Committee invite TENDERS for the manufacture and erection of TWO FOUR-LIFT GASHOLDERS, with Guide-Framing, at their Foleshill Works.

Each Gasholder will be to the following dimensions: Inner Lift, 141 ft. 6 in. diameter; Second Lift, 144 ft. diameter; Third Lift 146 ft. 6 in. diameter; and Outer Lift, 149 ft. diameter—Three Lifts being 29 ft. deep, and one Lift 29 ft. 6 in. deep.

Specification, with Form of Tender and Schedule of Quantities, may be obtained on application to the undersigned, and prints of the Drawings will be supplied, if desired, upon payment of £1 1s., which will *not* be returned.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tender, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, and endorsed "Tenders for Gasholders," must be delivered on or before Saturday, Feb. 14 next.

FLETCHER W. STEVENSON,
Engineer and General Manager.

Gas-Works, Coventry,
Jan. 23, 1903.

MANCHESTER CORPORATION.

(GAS DEPARTMENT.)

TO IRON AND STEELWORK CONTRACTORS.

THE Gas Committee are prepared to receive TENDERS for the supply and erection of a STEEL ROOF for Retort-House at their Rochdale Road Station.

General Conditions of Contract, Specification, and Bill of Quantities, can be obtained from Mr. C. Nickson, Superintendent, Gas Department, Town Hall, on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Drawings may be seen on application to Mr. J. G. Newbigging, C.E., at his Office, Rochdale Road Station.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for New Roof over Retort-House," must be delivered at the Gas Offices, Town Hall, not later than Ten o'clock on Saturday morning, the 7th of February, 1903.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Jan. 20, 1903.

THE Directors of the Henley-in-Arden Gas Company invite TENDERS for the supply and erection of a new GASHOLDER and TANK, about 12,000 cubic feet capacity, with 6-inch Connections.

Tenders to be delivered not later than Feb. 11, to JOHN W. LORD, Secretary.

MATLOCK AND DISTRICT GAS COMPANY, LIMITED.

THE Directors of the above Company are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, CLAY, &c.

Particulars of requirements may be obtained of the Manager at the Works, Bakewell Road, Matlock.

Tenders, addressed to the Chairman, to be sent in not later than Feb. 16, endorsed "Tender for Retorts."

ROBERT HALL,
Secretary.

Matlock, Jan. 24, 1903.

SHREWSBURY GASLIGHT COMPANY.

DESIRABLE INVESTMENT.

THE Directors of the above Company invite TENDERS for sufficient SHREWSBURY GAS CONVERTED ORDINARY STOCK to produce the sum of £14,176.

This Stock is entitled to a Standard Dividend of 5 per cent., payable half-yearly, and the Maximum Dividend has been paid for many Years.

January 30, 1903, is the last day for reception of Tenders.

Forms of Tender may be had on application to LLOYDS BANK, LIMITED, SHREWSBURY, or to the Company's Secretary, from whom any further Information can be obtained.

By order of the Directors,
WM. BELTON,
Secretary.

Gas-Works, Shrewsbury,
Dec. 18, 1902.

PLYMOUTH CORPORATION WATER-WORKS.

TENDERS are invited for the supply of the following Goods and Materials for a period of One Year:—

FIRE HYDRANTS.
LEAD PIPE AND PIG LEAD.
STOPCOCKS, FERRULES, &c.
CAST-IRON WORK.
SLUICE VALVES.

Particulars and Forms of Tender can be obtained at this Office on and after Monday, the 2nd of February, 1903.

The lowest or any Tender will not necessarily be accepted.

Tenders, enclosed in envelopes provided, to be delivered at this Office by Twelve o'clock noon, on Thursday, Feb. 19, 1903.

FRANK HOWARTH, Assoc.M.Inst.C.E.,
Water Engineer.

Municipal Offices, Plymouth,
Jan. 23, 1903.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 13th day of February, 1903, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half-Year ended the 31st of December last, to declare a Dividend for the same period, to increase the remuneration of the Directors, to elect Two Directors and One Auditor in the place of those retiring by rotation, and for General Purposes.

Notice is Hereby Given, that an Extraordinary Meeting of the Proprietors of the Crystal Palace District Gas Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 13th day of February next, at 3.30 o'clock in the afternoon, or as soon thereafter as the business of the Ordinary Meeting of the Proprietors shall be concluded, for the purpose of considering the Provisions of the Bill now before Parliament, intituled "A Bill to confer Further Powers on the Crystal Palace District Gas Company with respect to the Purchase and Holding of Lands, and to alter the Provisions of the Acts of the Company with respect to the Illuminating Power and Purification of Gas supplied by the said the Testing of Gas, and to change the Name of the Company, and for other Purposes."

At such Meeting the said Bill will be submitted for the consideration and approval of the Proprietors.

Dated this 30th day of January, 1903.

The TRANSFER BOOKS WILL BE CLOSED from the 30th day of January, until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
Jan. 30, 1903.

LAMBETH WATER-WORKS COMPANY.

NOTICE is Hereby Given, that it is the intention of the Company to SELL BY TENDER such amount of THREE PER CENT. INTER-COMMUNICATION DEBENTURE STOCK as will produce (after deducting Expenses of Issue) £22,000 in cash, being the amount sanctioned by the Local Government Board under the Provisions of the Metropolis Water Act, 1899. The Stock will be redeemable at par at the option of the Company on Six Months' Notice at any time after the expiration of 25 Years from the date of issue.

Particulars, Conditions of Sale, and Forms of Tender may be obtained at the Company's Offices, Brixton Hill, S.W.

Sealed Tenders are to be delivered at the said Office not later than Twelve o'clock (noon) on Monday, the 16th of February, 1903.

By order,
H. WILKINS,
Secretary.

Brixton Hill, S.W.,
Dec. 9, 1902.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the Hornsey Gas Company offer FOR SALE, BY TENDER, £5000 FIVE PER CENT. PREFERENCE STOCK and £5000 CONSOLIDATED STOCK, being a portion of £50,000 Additional Capital authorized to be raised under the "Hornsey Gas Order, 1902;" and they will be prepared to receive sealed Tenders for the Preference Stock and the Consolidated Stock not later than Twelve o'clock noon on Thursday, the 19th of February, 1903.

The amount of the Stock allotted must be paid up in full on or before the 28th of February, 1903, after which date Interest will commence to accrue.

The Interest on the Stock will be calculated Half Yearly to the 31st of December and 30th of June in each Year, and be paid by Warrants issued immediately after the Half-Yearly Meetings of the Company—usually in March and August respectively in each Year.

No deposit is required upon tendering.

Any amount, not being less than £10 or a multiple thereof, may be tendered for; and the Stock will be registered in the Company's Books in the names of the allottees or their nominees free of expense.

The minimum price, below which no Tender will be accepted, has been fixed in the case of the £5 per Cent. Preference Stock at One Hundred and Fourteen Pounds (£114) for each One Hundred Pounds of Stock, and in the case of the Consolidated Stock at One Hundred and Eighty Pounds (£180) for each One Hundred Pounds of Stock.

£100 of £5 per Cent. Preference Stock purchased at £114 will yield to the investor £4 7s. 9d. per cent. per annum.

The last dividend declared on the Consolidated Stock was at the rate of 9½ per cent. per annum. £100 of the Stock purchased at £180 will yield to the investor at the rate of dividend referred to £5 2s. 9d. per cent. per annum.

Particulars and Conditions of Sale, with printed Form of Tender attached thereto (upon which form only tenders will be received), may be obtained at the Company's Offices, No. 63, Chancery Lane, W.C., between the hours of Ten o'clock a.m. and Four o'clock p.m. Saturdays Ten a.m. to One p.m.

By order,
WILLIAM E. ROBERTS,
Secretary.

Hornsey Gas Company's Offices,
63, Chancery Lane, London, W.C.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction, in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Thursday, the 19th of February, 1903, at Two o'clock in the Afternoon prompt,

Mr. ATKINSON GIBSON, AUCTIONEER,

NEW STOCK (Maximum Dividend Five per Cent.), authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891, of an amount to raise

£24,400

The above Stock will be entitled to Dividend from the 1st day of January, 1903, and be registered in the name of the Purchaser free of charge.

A Deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 28th day of February, 1903.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Friday, the 6th day of February next, at Twelve o'clock (noon) precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending on the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such Meeting go out of Office in compliance with the Company's Acts or Schemes of Amalgamation.

Notice is Hereby also Given, that, at such Meeting, the Directors will apply to the Proprietors for authority to dispose of such further portions of the Company's property as are not now required for the purposes of their Undertaking.

Notice is Hereby further Given, that, pursuant to the Standing Orders of both Houses of Parliament, an EXTRAORDINARY GENERAL MEETING of the said Proprietors will be held at the same Office immediately after the said Half-Yearly Ordinary General Meeting, when a Bill to be introduced into Parliament, intituled "A Bill to enable the Gaslight and Coke Company to Raise Additional Moneys and to Purchase, Take, and Hold Lands, and for Altering the Standard Price of Gas and Redeeming Capital, and for other Purposes," will be submitted to the Proprietors then present, either in person or by proxy, for their approval.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Jan. 19, 1903.

BARNSTAPLE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Bridge Hall, Barnstaple, on Saturday, the 14th day of February, 1903, at Twelve o'clock at noon, to receive the Report of the Directors and the Accounts for the Year ended the 31st day of December last, to declare Dividends, to elect Directors and an Auditor, and to transact the General Business of the Company.

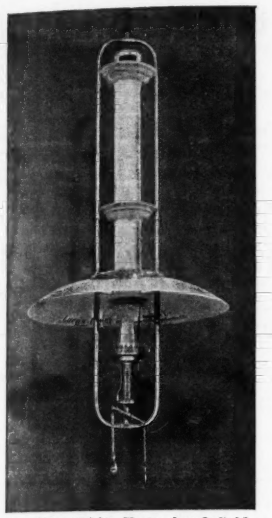
The TRANSFER BOOKS WILL BE CLOSED from the 31st of January to the 14th of February (both days inclusive).

By order of the Board,
F. L. SCHOFIELD,
Secretary.

Offices: 15, Cross Street, Barnstaple,
Jan. 13, 1903.

The INCOMPARABLE . . . . .

LUCAS LIGHT.



No. 699.—White Enamel and Gold Bronzed Pipes. Dimensions 49-in. by 8-in.; Shade diameter, 24 in.

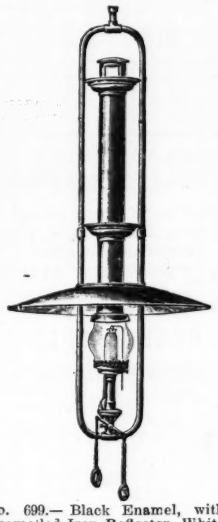
Price, with Metal Reflector, **£3 10s.**
" Porcelain " **£3 15s.**

LUCAS Lamps for Inside Lighting.

Illuminating Power, 700 Candles.

Gas Consumption, 17½ cubic feet per hour.

10 parts of Air to 1 of Gas.



No. 699.— Black Enamel, with Enamelled Iron Reflector, White Inside. Dimensions, 49 in. by 8 in.; Diameter, Shade, 24 in.

Price, with Metal Reflector, **£3 10s.**
" " Porcelain " **£3 15s.**

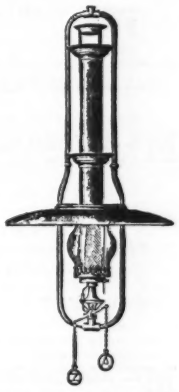
No. 698.— Illuminating Power, 400 Candles. Gas Consumption, less than 10 feet.

LUCAS Lamps for Inside Lighting.

Illuminating Power, 700 Candles.

Gas Consumption, 17½ cubic feet per hour.

10 parts of Air to 1 of Gas.

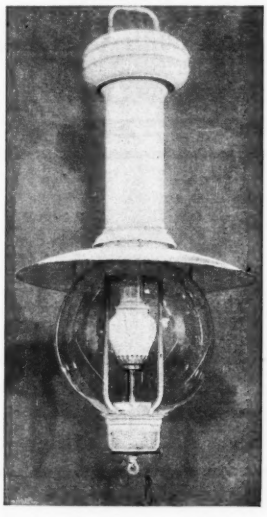


Dimensions: 36 in. by 8 in. Shade Diameter, 18 in. In Black Enamel with Metal Reflector, **£2 15s.** In White Enamel with Porcelain Reflector, **£3.**

MOST Economical.

No. 703.—Suspension Lamp. White Enamel, with White Enamelled Iron Reflector. Dimensions, 59 in.; diameter: Outer Globe, 18 in; Shade, 31 in.

Price, **£8 15s.**



THE ACME OF Simplicity.

LUCAS Lamps for Outside Lighting.

Illuminating Power, 700 Candles.

Gas Consumption, 17½ cubic feet per hour.

10 parts of Air to 1 of Gas.

No. 704.—Street Column Lamp. Black Enamelled Iron or Copper, with White Enamelled Reflector and Iron Frame. Dimensions, 50 in.; diameter at top of Lantern, 27 in.; at bottom, 11 in.

Price, **£7 10s.** Frog, **6s.**

GREATEST Efficiency.

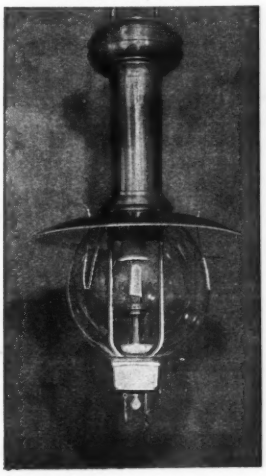
LUCAS Lamps for Outside Lighting.

Illuminating Power, 700 Candles.

Gas Consumption, 17½ cubic feet per hour.

10 parts of Air to 1 of Gas.

No. 703.—Suspension Lamp, Copper Enamel Iron Reflector, Black Outside and White Inside, Copper Outer Casing. Dimensions, 59in.; diameter of Outer Globe, 18in.: shade, 31in. Price, **£10.** The same lamp in Black Enamelled Iron, **£8.**



CAUTION.

Having ascertained that lamps are being manufactured and sold in this country in infringement of Letters Patent Nos. 14,553 and 23,222 of 1900, covering our Lucas Incandescent Intensive Gas-Lamps,

We beg to warn the Trade and the Public generally that proceedings will be instituted and vigorously prosecuted against all persons, firms, and companies manufacturing, importing, dealing in, or using such Lamps unless purchased from us.

MOFFAT'S LIMITED.

33, 34, & 35, CHARTERHOUSE SQUARE,
LONDON, E.C., in November, 1902.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ILFORD GAS COMPANY.

NEW ISSUE OF £6000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 17, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 300 £10 "C" SHARES.

MR. ALFRED RICHARDS will sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, Feb. 17, at Two o'clock precisely, in lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 17, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WEST HAM GAS COMPANY.

NEW ISSUE OF £19,100 OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK,

Offering to Trustees and others an investment of the soundest character.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, Feb. 18, at Two o'clock, in Lots.

Particulars of the SECRETARY OF THE COMPANY, at the Offices, Union Street, STRATFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

New and Important Work by
Mr. W. J. Dibdin, F.I.C., F.C.S.

Now Ready. 537 pp., Cloth Gilt. Price 21s. net.

With numerous Illustrations, Diagrams, and Tables.

PUBLIC LIGHTING BY GAS AND ELECTRICITY

BY

W. J. DIBDIN, F.I.C., F.C.S., &c.

Formerly Chemist and Superintending Gas Examiner to the London County Council.

Author of "The Purification of Sewage and Water," "Lime, Mortar, and Cement," "Practical Photometry," &c.

LONDON: THE SANITARY PUBLISHING COMPANY, LTD., 5, FETTER LANE, E.C.

THOMAS DUXBURY & CO., 16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.

165, QUEEN VICTORIA STREET, E.C.;

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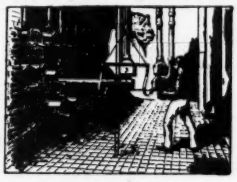

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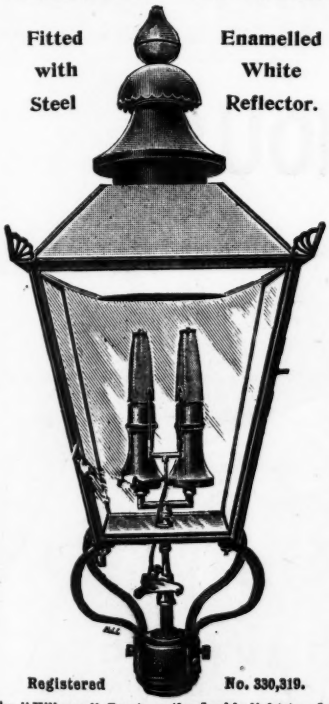

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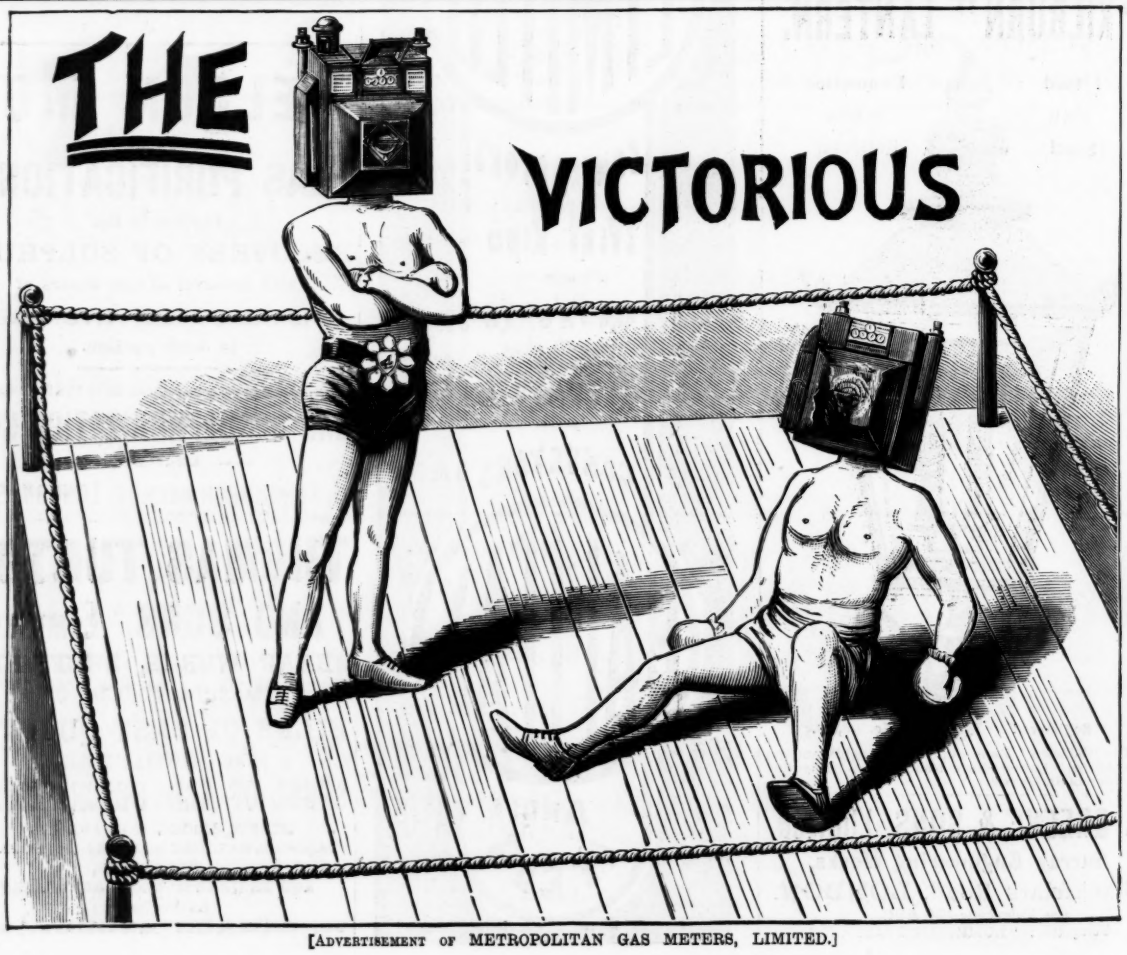

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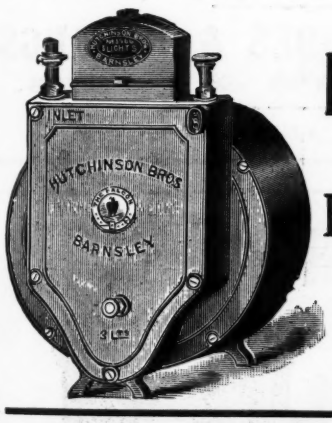

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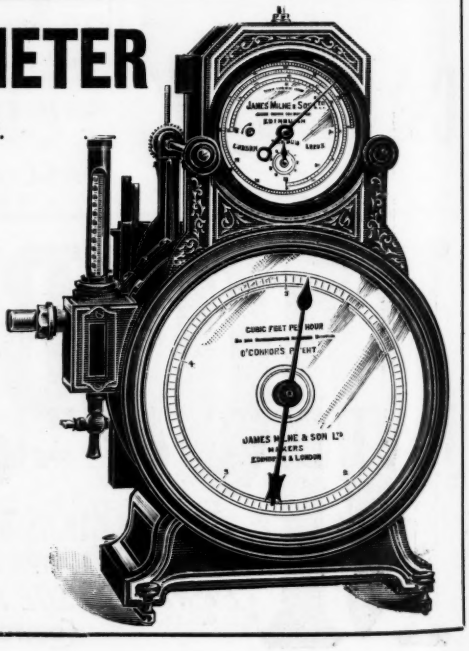

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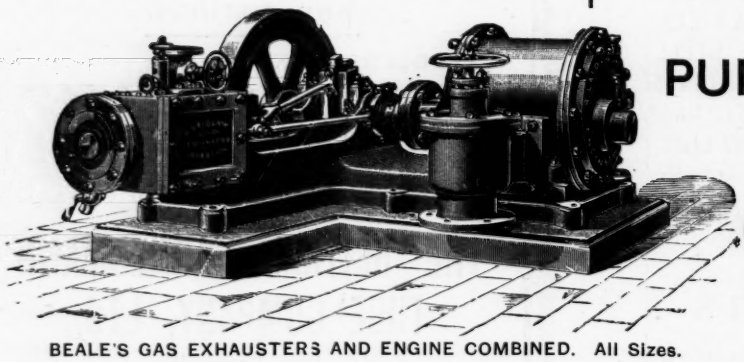

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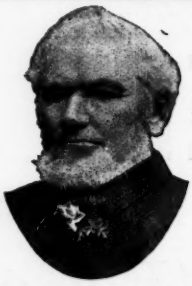

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